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PROBABLE TREND OF FUTURE PRICES.*

BY GEORGE E. ROBERTS,

Vice-President, National City Bank, New York.

I am not undertaking any extended or elaborate discussion of abstract theories concerning prices, but rather a brief and simple discussion of the salient facts of the present situation in as practical a manner as I can present them.

The main facts of the situation and the fundamental reasons for the rise of prices are known to all. They have resulted from the war. Millions of men were drawn from the productive industries and into the war of industries. Ordinary industry was interrupted, and production of the common commodities of consumption has been largely reduced. Communication between countries has been interrupted. A great amount of shipping has been sunk. Factories located in one country in many instances have been cut off from the source of supply of their raw materials in other countries.

In short the world's industry has been disorganized, and the connections between countries, the mutual dependence of countries upon each other to which they become accustomed through long years, have been broken up. This general disorganization of industry has resulted in many instances in an actual increase of the labour cost of producing commodities. Then in addition to that there has been the increase in the money cost, which has resulted from the disorganization of monetary systems and the great inflation of currencies which has been brought about.

The war brought on a practically unlimited demand for labour and materials. As we saw it in this country the Government let contracts right and left and the contractors went out into the markets and bid labour and materials against each other. Furthermore the ordinary commercial demand for private consumption was not reduced, except as it was in the latter days of the war actually choked off; but the great disbursements of the Government and the increase of wages, the full employment of the people, all had the tendency to put a great amount of money into circulation, to stimulate trade, and to create additional demands upon the industries. The banks were called upon as a matter of patriotic duty to lend money freely for the purpose of purchasing Liberty Bonds, and also for the support of industries.

So you see, we had practically an unlimited demand for labour and materials, backed up for the time being by a practically unlimited amount of credit, of purchasing power; and this amount of credit, purchasing power, turned loose upon limited supply

* A lecture delivered in New York.

of labour, because there was no more labour in the country than there was before the war and the limited supply of materials, inevitably brought about the rise of prices. And the situation was very much the same in all countries except that in many other countries they resorted more freely to inflation of the currency than we did. The amount that was raised for the support of the Government by means of taxation was larger in this country than it was in any of the other countries at war.

That is in brief the manner by which this rise in prices was forced, by which it came about; but it may be said that the war has been ever for more than a year now and there has been no decline in prices, on the contrary there has been a further rise.

The main reason for it is in the fact that the industries of Europe are so disorganized that they have not gotten back to normal production. The fact is that Europe went almost to the limit of its strength during the war. It exhausted its stocks of goods and materials; it wore out to a great extent its industrial machinery. A great deal of the machinery was actually destroyed or carried away from the place where it belonged. The railroads were crippled, and the equipment worn out. The transportation of Europe is in a broken down condition. The coal-mines were gutted during the war; that is to-say, every effort was made to get out the amount of coal immediately required with the smallest possible expenditure of labour, so that development work was not done. I have a friend just back from Germany who told me that between the break down of the transportation system and the limitation upon the production of the coal mines, it is impossible at present to get out in Germany more than about half the coal that the country requires.

Credit in these countries is in a demoralized state; the currencies are depreciated and of uncertain value; and finally the morale of the people is impaired. The people are anxious and worried, and apprehensive about the future. In many instances they have been inclined to look for relief to new systems of Government, to a change in the social order, rather than to the old time industry.

The fact is, that the world everywhere to-day needs enlarged production. That is the only remedy for the situation. Nothing else that purports to be a remedy can be in any degree effective unless it accomplishes increased production.

Take the case, for instance, of cotton goods, an article of common consumption, and of which prices are very high. We have more raw cotton in this country than we can possibly use. We produce in this country about twice as much raw cotton as our cotton mills can work up and yet there are cotton mills idle in every country of Europe, and the skilled employees are idle and receiving unemployment doles at the hands of the Government, because they are unable to purchase cotton in the United States.

In purchases from another country, you must do one of three things: you must either pay in cash, which in international trade means gold, or you must pay in goods, or you must obtain credit. Europe is not able to pay in gold and not able to pay in goods; they are not able to buy raw materials to make the goods. They must import their raw materials as in the case of cotton: they are not able to import because they have nothing to export, and they can't export until they get the raw materials. It is a case of industrial dead lock. It is a case of needing somebody to prime the pump to get it started, and that is what the United States ought to do. That is the situation as to one great commodity, a necessity, cotton goods; even though cotton should decline in this country, as it may through inability to export our surplus, even if that is the case, it is not certain that cotton goods will go down.

Because people don't buy raw cotton, they buy cotton goods. Raw cotton is one thing and goods are another; and goods are an international commodity, and the shelves are bare of cotton goods all over the world. There is no certainty at all that cotton goods will come down even in our own markets until the cotton mills of Europe are supplied with raw cotton and their people are put to work.

So again, take the case of sugar, another necessity which is at a high price now, although we are producing more sugar in the United States and in Cuba, which is our chief source of supply than before the war. We have ninety beet-sugar-factories in operation in the United States this year, and we had only sixty in operation before the war. The sugar crop of Cuba this year is four and one half million tons and in the year before the war it was about two and one half million tons and that was the largest crop they had ever had; so there is a great increase in the production of sugar in our own sources of supply. But England and France and other countries are buying in Cuba now whereas before the war they were supplied from the continent of Europe and the total production of sugar in the world is only about 16,000,000 tons this year as against 18,000,000 tons before the war.

Now we are not going to get sugar at normal prices in the country or anywhere, until the sugar mills of Northern France that were destroyed during the war are rebuilt, and until sugar production is received generally in Europe.

So it is as to many other things that might be named. Take the case of Russia. Russia has been in the past a great source of supply for food and raw materials, for Western Europe. Great Britain and France and all the countries of Western Europe drew largely upon Russia for wheat, for hides and wool and butter and eggs and lumber and other things of that character. Now that source of supply is entirely cut off. In the last year before the war, Russia's export of that class of goods was of the value of more than a billion and a half of dollars in the prices of that time. That is all cut off, and the world is not going to get back to normal prices, this country is not going to get back to normal prices until Russia is at peace and her people are back to their industries and producing these necessities as they did before the war.

This problem of prices is the problem of getting the people of the world back to work, and of increasing supplies in all markets. Whenever the demands of Europe upon this country for food decline, go back to approximately what they were before the war, prices of food in this country will decline, and they will decline all over the world. I can point to just one illustration of that.

In the first six months of this year the exports of pork products from this country were at the rate of approximately one hundred thirty million dollars a month, but in the last six months of this year, they were at the rate of only about one half of that amount, largely because of the high rates of exchange which make our products cost so much more to those people.

What was the effect of that? Live hogs in the western markets in July were worth about twenty-three dollars a hundred weight; to-day they are worth about fifteen dollars a hundred weight. That is the result of a falling off of the European command.

So I don't believe that these prices are to be considered as permanent in the long run at all. They will last until the world can be gotten back into production, and I am hardly able to predict how long that will be. But I think that whenever the foreign demand for our food products falls off, inasmuch as food products are the basis of the entire economic structure, other prices will come down also. I know that it is very commonly said that prices are always going to remain

high because wages have advanced and that wages will never be reduced. But however much we may desire that wages shall be high, the economic law at last will make itself felt.

The great purchasing power of the farming districts of this country to-day is the most important factor in the industrial activities of the whole country. The big buying power of the great interior of the country which is directly related to the farm is the principal factor to-day in the great demand for goods which is keeping these industries throughout the East busy and which makes the manufacturers ready in great wage increases which they can immediately recover in the prices of the goods.

But if the value of what the farmer grows and has to sell is to be cut in two it is not going to be just that he shall continue to pay war prices for what he buys. He will not be willing to do it, and what is more he will not be able to do it, even if willing; he won't be able to buy; in the aggregate more than one half of the wage-earners will be out of employment (one half of those who are supplying that portion of the population) or there will have to be a reduction of prices and the general scale all round.

So, there briefly and concretely is my opinion of what we may look far—that as Europe gets back to production, which is not going to be right away, we may expect a general decline in the price level. I don't think the prospect for the coming year for a reduction of prices is good. The crops of Europe for the coming year cannot be full crops. Russia is not going to be back into normal production during the coming year. Even the prospect in the United States for the next wheat crop at this time is not very good, because the acreage is 23 per cent below that of last year and the crop did not go into the winter in very favourable condition.

There is one other factor which has bearing upon prices in the near future, and that is this question of credit to Europe. Europe needs to buy heavily in the United States for the coming year; but the question of her ability to buy, of how the purchases are to be financed, is a very difficult one. It has not been solved. The discount upon European currencies is very heavy, making their goods bought in this country cost in many instances double the price which they cost us here at Home. We think that prices are high here, but how can the people of France afford to buy goods here when they must pay not only our prices but a premium of 100 per cent to get a draft on New York and pay the high ocean transportation besides? We don't want our prices to go down because we are unable to fill the needs of Europe. That will be the effect if these credits are not supplied. In that even I think there will be an early decline in the general prices of goods and the price-level, and something of a reaction in a business in the United States. But I say that, much as we should like to have prices go down, we don't want prices made low as the result of the congestion of products in the markets of the United States while people are starving for them in Europe. Moreover that is not the road back to normal conditions. That road is by helping the people of Europe to become self-supporting again, to provide for themselves and to increase production for the whole world.

I think your societies are especially interested in China, where the exchange rates are now very high. China is a silver-basis country. Any payments that are to be made in China must be converted into silver and the price of silver is more than double what it was before the war. Silver as a commodity, has been subject to the same influence that have affected other commodities, but it has been subjected to some special influences besides. For one thing, the troubles in

Mexico have largely reduced the production of silver in that country, and it is one of the chief silver-producing countries of the world. The production of silver in Mexico fell from about seventy million ounces a year down as low as twenty-five million ounces a year; but this last year I understand the production has been larger.

Then again the rise of prices and the general trade activity, the increase of wages, has made it necessary to coin a great deal more silver for use as money. Silver is the pocket money of the whole world. It is the money of retail transactions. Taking our own country as an example, for the five years prior to the war the average consumption of silver for coinage in the United States was about three and one half million ounces, a year, and for the five years beginning with 1915, the average consumption in this country has been about twelve million ounces nearly four times as much; and just about the same ration exists in Great Britain and also in France. The consumption of silver in 1913 in Great Britain for coinage was about five million ounces, and last year it was 28 million ounces. So that in all these countries there has been a great increasing demand due to the rise of prices, the full employment, the higher wages, and all of that; but beyond that the greatest demand has been from Asia. The exports of Asia have increased during the war, and, through their inability to buy and to get deliveries of goods, their imports have not increased in the same proportion, so that there has been a large balance of trade in favour of Asia which had to be settled in silver. That has made an extraordinary demand for silver which is still maintained.

Now as to the future of silver, I would say that the demand for coinage purposes is certainly going to be very much less, because the price of silver has reached the point where silver is worth more as bullion than it is as coin at the coinage ratios that are used in all the important countries; so they can't afford to coin it into money and they are put to the necessity of either abandoning the use of silver, or taking nickel or some other metal for use as money which they can do for token coins, or of reducing the amount of silver in their coins by putting in an alloy. The consumption of silver for coinage purposes is going to be very much less. As to what the demand will be from Asia, it is impossible for any one to predict; but at the present it seems likely to be heavy for some time to come. So that I don't predict or look for any improvement in that situation for the year to come, and I don't look for any large change in the situation for the coming year, but I do believe that the present situation is normal and artificial and due to the war, and due to the fact that the people of the world are not producing goods at the normal ratio, and that as Europe gradually recovers her production, we will find the prices of all products, silver included gradually.

I have given some attention to the general effect of the inflation of the currency. That was a factor in the rise of prices, and it will be a factor in retarding the decline of prices; but as production increases and as these nations get their budgets balanced so that they will no longer be printing paper money to pay their expenses, and as people begin to save and accumulate capital, we shall find the currency gradually reduced. The accumulation of capital is one of the most important factors in the situation, although it seems to be the fashion nowadays to think that we haven't very much use for capital, but when you consider what capital is, that it is simply a form of property which is used in production, that it is machinery and equipment for producing the things that the world needs, you will understand that we need more of working capital.

In conclusion, I would say that one of the

great lessons of the war is that of the mutual dependence of the countries, that the peoples of the world have an interest in one another, that the greatest prosperity for any people can only be secured at a time when all other peoples are having the greatest possible prosperity. We have seen the nations at war making every endeavour to destroy property belonging to their neighbours, their enemies at the time; and now that the war is all over, we see that they are all alike the worse for it, that the world can only come back into its formal life by bringing back every nation, Germany included. It is a great mistake to think that the people of Germany can have everything taken away from them and be made helpless and ineffective and unproductive and that the rest of the world can benefit by it. They can't do it. Germany has got to be made able to help herself and to become a useful factor in the world again.

H. M. Commercial Commissioner at Vienna has forwarded information which includes plans and diagrams in German regarding the new Austrian Government Bill concerning the electrification of the Austrian State Railways, together with supplementary matter. This Bill was introduced on 15th July in the Constituent National Assembly and provides for the electrification of 650 kilometers of the western part of the railway system by the end of June, 1925, at a cost of 5,096 millions of crowns, to be raised by loan. At a later date 1,135 kilometers are to be electrified.

AGRICULTURE IN TRAVANCORE.

By "Rusticus."

THERE could be no better testimony to the progressive character of the administration of the Travancore State than the fact that, although it is only 7,129 square miles in extent, it spent some Rs. 95,000 on its Agricultural and Fisheries Department in 1918-19. The Report of the Department for that year shows that it got good value for the money. The energies of the Agricultural Branch were naturally mainly devoted to work on the two principal crops of the State—coconut and paddy. In this connexion, we would suggest that it would be helpful if, to reports of all agricultural departments, whether of British Provinces or of Native States, were prefixed a statement or better still a map showing the distribution of the most important crops and their relative importance. We should imagine that, in Travancore, it would be a case of coconut and paddy first and the rest nowhere but we have no means of verifying this. There is, however, no doubt that the prosperity of the State depends in large measure on the coconut palm and that the Agricultural Department is confronted by a serious problem that of eradicating the root disease which has attacked that valuable tree in recent years. So far all that it has been able to do is to prevent the spread of the disease. This it has done by segregating infected trees in isolated localities, by propagating varieties which are disease resistant, by destroying hopelessly infected trees and by improving the general condition of trees by better cultivation and manuring. These measures seem to have been successful in arresting the onward march of the disease, but that is obviously not sufficient. If the disease is to be stamped out, its cause must be discovered. A Mycologist has recently been appointed to the Department, whose

first task will be to discover what can be done in this direction. After making himself acquainted with the local conditions, he is to go to Pusa for further training. We are very glad to see this evidence that Native States are willing to avail themselves of the facilities afforded by Pusa. The use of these which has been made in the past by workers in all branches of Agriculture throughout India has, in our opinion, been entirely insufficient. Meanwhile, a special staff is engaged in work on infected trees. Sometimes the disease attacks the outer ring of leaves and sometimes it is the innermost 'cabbage' which is first affected. In the latter case, it has been found that cutting away the rotten portion of the cabbage and spraying the remainder with Bordeaux mixture are sufficient to ensure complete recovery when the tree is only slightly affected but that if the attack is a bad one, nothing can be done. The experiment was only conducted on 85 trees and this brings us to one of the criticisms we have to make on the work of the Travancore Agricultural Department which is that its experiments are conducted on such a small scale that it deprives them of much of their value. The manurial experiments on coconut trees on the Experimental Farm, Trivandrum, which have been longest in progress were confined to ten trees only. These experiments were started nine years ago and, in that period, the average annual output of the trees has increased from 4·4 to 67·1 nuts. The cost of manure is only 5½ annas a year so that, if as is claimed, the whole of this great increase is due to manuring, the results would be of the greatest importance if it were certain that they were applicable on a large scale. But it is impossible to deduce anything from an experiment on ten trees. It is true that there are other manurial experiments on coconut trees in progress at Trivandrum. Details of these are given in an appendix to the Report a study of which shows that the same criticism applies. Only 34 trees are affected in all and there are eleven different experiments in regard to them. Surely if these experiments are to be of any value in showing how far the application of manures increases the outturn of coconuts, it is necessary to take a large garden with at least 100 trees in it and treat half of it in one way and half in another. Yet another appendix gives notes of observation on the yield of 12 coconut trees in the office garden at Quilon. In regard to this, it seems only necessary to point out that the number of coconut trees in Travancore must run into hundreds of thousands if not millions.

The manurial experiments on paddy were on a somewhat larger scale. One series was intended to test the value of different kinds of oilcake and the other that of green manure and nitrogenous fertilizers. The best results in the first series were obtained from the use of castor cake and in the second from that of 280 pounds of green manure, 17 pounds of ammonium sulphate and 9 pounds of super phosphate on a plot of 6½ cents. These experiments were conducted at the paddy farm at Nagercoil where work on seed selection and hybridization is also in progress. The Director of Agriculture, Dr. Kunjan Pillai claims that, as a result of repeated selection of seed, it has been possible to evolve a strain of paddy which possesses the specific quality of salt resistance. In proof of this, he instances an area of two acres on the farm which was so saline that it yielded hardly any crop when the farm was first brought under cultivation three years ago, but has now begun to yield a normal crop. In 1916-17 the yield was 5,896 pounds. In 1918-19 it was 7,389 pounds. An improvement of about 25 per cent does not seem to constitute the difference between "hardly any crop" and a "normal crop" but that is by the way. What is of importance is the claim that the improvement in yield is solely due to the improvement of seed by selection and the *improvement of soil by scientific cultivation.*

The italics are ours for we have little doubt that the improvement in yield is solely due to the better cultivation and has nothing to do with seed selection. We consider it most unsafe to base any claim to have evolved a salt resistant variety of paddy on the figures given by Dr. Kunjan Pillai. It will be many years before sufficient data on which to base such a claim will be available.

It is interesting to see that the Travancore Deparment has embarked on the cultivation of cane. A site for a farm at Alwaye, which is said to have once been an important cane centre, though the area under the crop can never have been very large, has been placed at the disposal of the Department and is to be used mainly for experiments on cane. Meanwhile tests of different varieties are being conducted at Trivandrum. Only three out of 22 managed to survive the unfavourable conditions of 1918 and of these Red Mauritius proved the best so that Travancore experience agrees with that of Mysore.

The Travancore Agricultural Department realizes the important fact that the only way to convince the ryot of the value of its work is to carry it out on his land and it has a staff of thirteen officers in all engaged in doing this. At the same time demonstration farms are as indispensable as books of reference and four more of them will shortly be working. The economic planting of paddy has made great progress in Travancore and in South Travancore, the area in which single seedling transplantation is adopted is now so large that exact figures of it are no longer available. Central and North Travancore have lagged behind in this respect but even there this method is followed on 1,000 acres. Selection work in the Government farms has been so successful in improving some of the indigenous varieties of paddy that the improved seed can now be given up with confidence to the cultivators. An interesting development has been the formation of Seed Unions on the lines which have worked so well in regard to cotton in the Central Provinces and parts of Madras. Thirteen of these Unions have been formed. The presidents of these are supplied by the Department with improved paddy seed which they cultivate on their own land under the supervision of agricultural officers. The produce of the crop is to be distributed amongst the members of the Union. In its work of distributing improved seed and seedlings, the Department is largely assisted by private enterprise. One firm sold several thousand coconut seed nuts and seedlings last year and the sale of the seed of Banku paddy, a prolific variety introduced by the Agricultural Department some years ago is now carried on entirely by the cultivators themselves. The sale of manures is still mainly departmental but, here also, outside assistance is being enlisted and manures to the value of nearly Rs. 8,000 were sold by commission agents against departmental sales amounting to Rs. 22,000. The sale of improved implements was, as elsewhere, much handicapped by the great difficulty in obtaining them and only the balance of the stock in hand could be sold during the year with the exception of four ploughs which were obtained from the St. Joseph's Asylum Industrial Workshops, Mangalore.

That the Veterinary Branch of the Department did very useful work is shown by the increase in the number of patients treated from 4,350 to 6,577. The increase was partly due to an increase in the number of hospitals and dispensaries and partly to a wise revision of the rules regarding the levy of fees. Agricultural live stock are of such importance to the community that the small expense involved in exempting them from fees when treated as outpatients is amply justified.

The Fisheries Branch more than pays for itself. Expenditure last year amounted to Rs. 11,808 and receipts to Rs. 12,700. It has only been in recent years that Governments in India have woken up to the fact

that in their fisheries they possess a very valuable asset. The value of fish and fish products exported from Travancore last year was estimated at Rs. 19 lakhs so that the necessity for a Fisheries Department is apparent. The principal work on which it was engaged was fish curing and 13,500 maunds of fish were cured in the two yards at Muttam and Alleppey. Experiments in smoking fish were also carried on and showed that fish can be preserved in this way for several weeks. The fish oil factory which was started at Alleppey during the year was only able to work for ten days as the price of fresh fish was so high that it was not possible to turn it into oil and guano.

The Travancore Agricultural Department deserves great credit for the efforts it is making to ameliorate the social and economic conditions of the fishermen who, in Travancore, as in all the maritime parts of India, are amongst the most backward classes of the community. The special school for children of the fisher class at Panavally had 71 boys at the end of the year. In addition to instruction in the "three R's," they are being taught net making, coir work and weaving. The profit from the finished products is divided amongst the boys themselves, being temporarily deposited in the co-operative society which is linked with the school until the boys leave when it gives them a little capital with which to start life. The Co-operative Society for fishermen at Pallipuram has made a good beginning. It is intended both for production and distribution. One branch will sell the fish and coir of its members and the other will purchase rice and paddy on their behalf. In this connection mention should also be made of the two night schools which are attached to the experimental farms. They have 29 students, most of whom are day labourers on the farms who were quite illiterate when they joined but are now able to read and write Malayalam and to do simple sums in arithmetic. The Agricultural Department in Travancore is, therefore, doing its best to increase the number of useful members of the community.

PAPER-MAKING MATERIALS IN THE PHILIPPINES.

[*In view of the importance of paper making in the Mysore State, where the possibilities of manufacturing paper from the bamboo have been demonstrated to be great, we publish the following article taken from the "Journal of the Society of Arts."—Ed. M. E. J.*]

The Philippine Islands produce an abundance of fibres and other raw materials for the manufacture of paper pulp on a commercial scale, but at present none of these is being utilized for this purpose. So far as is known, no paper has ever been made in the Philippines except for experimental purposes. The country also contains plenty of the raw materials required for the manufacture of the chemicals used in paper pulp making, but none of these chemicals is now being produced locally.

More than a decade ago, Mr. G. F. Richmond, for several years attached to the chemical laboratory of the Philippine Bureau of Science, made a very careful survey of the materials available in the Philippines for the manufacture of paper pulp, but, according to a report by the U. S. correspondent at Manila, no practical use has yet been made in the islands of these valuable data.

The experiments made by the Bureau of Science were undertaken with the object of determining the commercial availability, for paper-making, of the fibres from members of the plantain family, such as abaca (manila hemp), banana, and plantain; of maguey (*Agave cantula*); of certain palms; of bamboo; of grasses; of certain woods; and of other less important plants.

Bamboo.—Of all the materials for the manufacture of paper found in the Philippines, the bamboos are the most important, considered from every standpoint. Not only

is the paper made from bamboo of excellent quality, but a constant, adequate, and accessible supply of this material could be made available for a paper or pulp factory more readily than could such a supply of any other material. Its rapidity of growth is an important item among the various qualities that render bamboo valuable as a paper-making material. Experiments were made with the two most important and widely-distributed bamboos. There are the common, thickwalled variety (*Bambusa blumeana*), and the thin-walled, dwarf bamboo, also known as cana bojo, of the genus *Schizostachyum*.

The thick-walled variety is that commonly employed for building purposes throughout the islands. It is planted as a crop along the river bottoms of the Pampangan plain, on Luzon, and in other sections of the Philippines as well. Propagated from cuttings, the plants are set out in rows from sixty to ninety centimetres apart. Marketable culms are produced in from one to two years.

The cana bojo, or dwarf bamboo, is that employed throughout the Philippines for the manufacture of woven products used for furnishing the interiors of nipa houses and for other purposes, such as the *sauale*, *quisame*, *amatong*. The cana bojo is found almost entirely within the forested regions of the country and is a veritable forest pest. It is never cultivated, but is cut without restraint in the forest regions to prevent its deleterious effect on forest growth.

In the Province of Bataan there are two contiguous areas of cana bojo, one of them containing 1,200 hectares (hectare=2·47 acres), 800 hectares of which are covered with a dense stand of cana bojo. The other area includes about 650 hectares, of which over 40 per cent is covered with this variety of bamboo. Small areas of cana bojo are found in the same province along the Bamban, Buasao, Pinulot and Bacan rivers, in the basin of the Colo River, and in the basin of the Mababo or Balsic River. Some of these areas contain a higher percentage of timber trees than do others, and are, consequently, less thickly studded with bamboo. In an average stand of this variety of bamboo there are about 9,000 culms to the hectare. An ordinary green cane weighs 7·2 kilos, and an air-dried cane, without the nodes, weighs 3·75 kilos. A hectare would, therefore, produce about 33·75 metric tons of dried material. Mr. Richmond calculated from his experiments that two metric tons of air-dried material would produce about one short ton of pulp. The yield of pulp would consequently be approximately seventeen tons to the hectare, or nearly eight tons to the acre.

The experiments made by Mr. Richmond developed the following important facts in respect to bamboo as a paper-making material:—

1. The dwarf bamboo (cana bojo) is better than the variety used for building purposes, in that it yields more unbleached pulp and requires less of the bleaching agent to give the best results. The structural bamboo requires from 20 to 25 per cent of bleach to give but poor results, but a satisfactory white is obtained from dwarf bamboo with from 10 to 20 per cent of bleach. This compares well with the results obtained from straws of various kinds.
2. A well-digested pulp is obtained from bamboo by the use of from 10 to 20 per cent of caustic soda, calculated on the gross weight of the stems.
3. The time required for digestion, the pressure and the temperature employed are materially less than those required in making pulp from soft woods by the same

process. In fact, in these particulars, bamboo compares favourably with straw and similar materials.

4. Both the sulphite and soda processes may be employed in working up cana bojo. By the former process, fully 50 per cent of unbleached pulp may be obtained, and that, with the use of much less sulphur than is necessary for the making of wood pulp. By the latter process 43 to 45 per cent of air-dry, unbleached soda-pulp is obtained. The use of caustic soda is recommended for bamboo because of certain difficulties to be overcome in the use of the sulphite process. The results described were obtained by the use of caustic soda under the following conditions: (*a*) Upright cylindrical stationary digesters; (*b*) direct live-steam heat; (*c*) 15 to 20 per cent of 76 per cent caustic soda, calculated on the air-dry weight of the raw material; (*d*) a duration of cooking of from four to six hours; (*e*) a maximum temperature 160°C. (320°F.) corresponding to a steam pressure of 45 kilos.

5. Pulp obtained by the sulphite process is not light enough in colour to be mixed with mechanical wood pulp in the manufacture of newsprint paper.* It is entirely suited in point of colour for use as a wrapping paper. But it is too valuable, by reason of its fibre, to be used for wrapping paper or for the making of newspaper stock. The strength of bamboo fibre makes it specially adapted to the manufacture of book paper and certain grades of writing and lithographic papers. For these purposes it may be used alone or mixed with rag or sulphite wood pulp.

6. If the bamboo pulp is to be used in the making of book and lithographic papers, the soda process should be employed in its manufacture, because bulk, softness and opacity are the chief features of soda pulp. This pulp bleaches to an excellent white with from 12 to 15 per cent of bleaching powder. The resulting sheet is more bulky than that from wood pulp and possesses a strong fibre 2·5 to 3 millimetres in length—longer and narrower than spruce fibres—and a good felting capacity.

Abaca or Manila Hemp.—The Philippine Archipelago is the home of abaca (manila hemp), the source of all materials from which the genuine Manila hemp paper is made. The plant (*Musa textilis*) is a species of wild banana, of which there are several found in the Philippines. The fibre from this plant is the world's premier cordage material and comprises the chief article of export of of the Philippine Islands.

Abaca waste, available for paper-making, is of two kinds, namely, that made up of old worn-out rope, gunny sacks, waste thread, and binder twine made from the fibre; and the true abaca waste, *i.e.*, the fibre that is missed in the stripping of abaca or extracting the fibre from the stalk of the plant. There is very little of the former to be had in the Islands. When abaca waste is mentioned in the Philippines, the term signifies that portion of the fibre that is missed or thrown aside with the stalk pulp at the time of, and in the process of stripping the fibre or extracting it from the plant, either in the hills or on the plantations where it is grown.

Abaca, the fibre extracted from the plant of the same name, is taken from the petioles

or sheath-like leaf stalks, which, wrapped one about another, form the stem or trunk of the plant. The stripping process consists of separating the fibre from the cellular matter of the petiole.

From this process two kinds of waste material are obtained, both of which are of value in paper-making. One of these is called fibrous waste, and the other semi-fibrous waste. The former is made up of the broken, tangled, or lost but clean fibres mixed with strips or bands of fibre aggregates from which the cellular and incrusting matter has not been entirely removed. The fibre contained in this waste has all the qualities of the fibre that is recovered by the stripper and subsequently employed in the manufacture of cordage. It is therefore identical with the fibre contained in rope waste, well known among manufacturers of paper. There is this difference, however; this fibre is fresh and has not suffered the deterioration of age.

The semi-fibrous waste resulting from the process of stripping abaca is due chiefly to the method by which the stalk of the plant is made ready for the stripping process. The plant is prepared for hand stripping by cutting off a portion of each end of the stalk to facilitate the removal of the petioles. Several of the outer of these are usually discarded on account of being bruised and discoloured. The fibre which is recovered as the abaca of commerce is contained chiefly in the outer surface of the petiole. The inner surface of the petiole and the portion between the two surfaces are made up, for the most part, of cellular matter, although they also contain much fibre of a lower tensil strength than that contained in the outer surface.

After the petiole has been removed from the plant stalk, preparatory to stripping by the hand process, ribbon-like strips are peeled from the entire length of its outer surface. Only these thin, fibrous ribbons are submitted to the hand-stripping process. All the remainder of the petiole is discarded. As already pointed out, this discarded portion, while containing chiefly watery, cellular matter, also has much fibre that is valuable, though never recovered by the hand process of stripping. This cellular portion of the petiole, the discarded outer petioles and the cut ends of the stripped petioles make up the semi-fibrous waste of abaca.

The habitat of abaca is in southern Luzon; the Provinces of La Laguna, Cavite, Batangas, Albay, Ambos Camarines, and Sorsogon; Samar and Leyte and southern Mindanao, chiefly. A mill situated anywhere in the islands would require a more or less considerable haul for most of its supply of abaca waste. It would also have to solve the problem of collecting the waste in the various regions where it is produced. Undoubtedly this would be an easy matter. Once abaca growers knew that there was a market for the waste at a price to leave a reasonable margin of profit over the cost of baling and collecting, the waste would be taken care of as systematically as is now the case with cordage fibre. In fact, a considerable amount of this material has been collected and exported from the Philippines at different times.

The semi-fibrous abaca waste owing to the length of time, the pressure and the strength of caustic soda required to remove the cellulose matter, cannot be used profitably in the manufacture of the batter grades of paper. But this material might readily be manufactured into wrapping paper of the sort in which strength and cheapness are of more importance than colour, by the process employed in working up jute—that is, by the use of lime, cooking under pressure, and partial bleaching.

Grasses.—Grasses of several varieties have long been in use for the manufacture of paper stock. Perhaps the most widely known of these is the esparto grass (*Stipa Tenacissima*), for many years an article of commerce in the Mediterranean countries.

This grass has been employed in some of the mills of Europe for many years. In India, the Bhabar grass (*Ischaemum angustifolium*), which yields a paper but little inferior to that of esparto, is very generally in use. The Munj grass (*Saccharum sara*) and several other grasses of the same species are constantly used. The paper industry of India is founded principally on these grasses and has become very extensive.

Mr. Richmond experimented with two Philippine grasses, cogon (*Imperata exaltata Brong*), and Talahib (*Saccharum spontaneum*), and found each to be an important source of paper stock. Cogon grass grows from two to four feet in height, and is found in even stands on open lands, foot hills, and low mountains in almost every part of the Philippines. It is broad-leaved, gregarious, and thrives with but little moisture on almost any sort of land. In many sections of the Islands, where nipa is not to be had, the natives rely on cogon grass roofing and siding for their houses.

Cogon grass is found in abundance in the central plain of Luzon on most of the open land. In the Province of Tarlac, between Capas and Concepcion, there is a good stand of cogon grass covering a level area of abandoned rice and sugar land. The grass on this area is usually of good stand and quality. Throughout Tarlac Province and, to a less extent, in the adjoining provinces, there are large areas of open land covered with cogon grass of good quality. Cogon grass is also abundant in the Visayan Islands.

Cogon grass is not jointed. This quality is regarded as of great advantage in the matter of making paper pulp. Its yield is from 5 to 10 per cent more than that of cereal straws, and it is more easily pulped with a smaller proportion of caustic soda. It has the further advantage over cereal straws that it can be harvested just before it is ripe, a period when it gives the best results. Cogon is easily prepared for digestion, and requires no preliminary cutting down after being dried, hand-picked, or machine cleaned.

Talahib (*Saccharum spontaneum*) is a coarse jointed grass growing from six to ten feet tall. It is gregarious, and springs in tufts from stout underground root stalks. Talahib is often confounded with cogon grass. It is very different from the latter, however, in both its appearance and habits of growth. Talahib thrives best in low, moist land and flourishes in river vallies and areas subject to annual floods.

This grass generally occurs with or near cogon grass, growing vigorously in the wet places where cogon does not do so well, and being of a poor variety on the up lands where cogon thrives well. It is difficult to get rid of. Cutting and burning has but little effect on it other than to increase its yield and quality. Talahib is related to the *Saccharum sara* (the Munj grass of India) and *Saccharum officinarum* (the sugar-cane of tropical countries).

An experiment carried out by Mr. Richmond with a small quantity of talahib, fully matured with entire stems and leaves, gave as result a percentage of 53·9 of cellulose.

Bananas and Plantains.—Plantains (*Musa paradisiaca*) and bananas (*Musa sapientum*) contain much fibre that might be utilised in the manufacture of paper stock These plants abound almost everywhere i the Philippines. Probably close to 100,00 acres are planted to them. The fibre fro them has not the tensile strength of abac but this is considered by Mr. Richmond a advantage when the fibre is to be employ in the manufacture of paper pulp. Near 20,000,000 bunches of fruit are gather yearly in the Islands from these plants, a there are, therefore, a like number of f grown stalks which annually go to was since practically no use is now made them. The figures do not include the v non-edible plantains, which are com

throughout the Philippines and which might be utilised in the making of paper stock.

The chemical investigation of plantain fibre carried out at the Bureau of Science showed a percentage of 68·21 of cellulose. There appears to be no good reason why a plantation of bananas might not yield a profitable revenue from its fruit, and at the same time supply a pulp mill with the stacks discarded when the fruit is harvested. At the present time no bananas are exported from the Philippines; nor is the domestic market as well supplied as it should be, considering how valuable the fruit is as an article of diet.

Maguey Waste.—Maguey (*Agave cantula*) and sisal are being extensively planted in several sections of the Philippines. These plants yield a fibre that is well known to the cordage world. This fibre is extracted by retting at present, but a moment is on foot to revolutionise the methods of recovering it by the introduction of machines. When maguey and sisal fibre is extracted by machinery there is a considerable quantity of waste that is comparable to abaca waste. The maguey, owing to the nature of the leaf of the plant, is considerably more bulky than abaca wasts.

Other Materials.—Bowstring hemp (*Sanseveria zeylanica*) is found in many parts of the Archipelago. It is not, however, of commercial importance. It has possibilities and might be cultivated for its fibre, which is not unlike that of maguey.

Coconut coir (husk fibre) might be produced in abundance in all the coconut regions. At the present time this by-product of the coconut industry is almost entirely neglected. It might be utilised very profitably in the manufacture of paper.

The leafstalks of the nipa palm contain valuable paper substance. At present little or no use is made of these, though a vast amount of the nipa leaf is used in almost every section of the islands for thatch and siding for houses.

The buri palm is widely used in the manufacture of hats and other handicraft products, and yields an immence amount of waste in the process of extracting the material utilised for these purposes. No small part of this waste might be employed in the making of paper stock.

The milling waste of certain soft Philippine woods is known to be valuable as a source of paper stock. Mr. Richmond made successful experiments with lauan, kupang, and similar varieties.

It is not conceivable that any of the mincr sources of paper pulp mentioned above would alone yield enough material to keep a mill in operation, but, nevertheless, they are not altogether negligible at a time when the world appears to be facing a shortage of such substances.

Raw Meterials for Paper-Making Chemicals.—It is the opinion of the Director of the Bureau of Science that caustic soda, sodium sulphite and the bleaching powder required in the manufacture of paper could be manufactured in the Philippines if there were a demand for them. At present all such chemicals are imported.

An international exhibition will be held in the spring of next year, under official auspices, at Ghent, of architecture and building and subsidiary industries. The object of this exhibition is stated to be the desire to give an impetus to reconstruction in the devastated areas.

THE MURRUMBIDGEE IRRIGATION SCHEME IN AUSTRALIA.

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WHILE enjoying a short holiday in Australia I have taken the opportunity of becoming more acquainted with the unique Murrumbidgee Irrigation Scheme, and knowing how very important irrigation is to the prosperity of India I wish to tell you something of this undertaking through the kindness of the Editor and in the pages of the valuable *Mysore Economic Journal*.

THE SCHEME.

The scheme is located in the State of New South Wales on the Murrumbidgee River at a distance of 353 miles from Sydney. The total area watered at present is not less than 70,000 acres, but eventually the plans call for a total watered area of 200,000 acres. The plan of the scheme in bare outline is quite simple—there is a huge concrete Dam uniting two hills which makes possible the storing of water for a great many miles back; that water is distributed to farms over a large area by means of canals and channels.

The engineering work of the scheme may be divided under three main headings, namely :—

1. Burrinjuck Dam, and works incidental thereto.
2. Berembed Diversions Weir, Main canal, and Main Branch canals, with structures therein.
3. Supply and Drainage channels, Roads and other works necessary for the development of the irrigated farms.

The scheme was constructed by the State Government for the purpose of settling people on the land free from drought conditions, and is now administered by a Water Conversation and Irrigation Commission. It has proved a great success.

A brief 'resume' of the history of the Murrumbidgee Irrigation Scheme may be interesting. The first proposals for irrigation in the State of New South Wales took tangible form as the result of the Royal Commission on water conservation that concluded its deliberations in 1884. This Commission amongst other proposals, suggested the construction of canals from the Murrumbidgee River to supply water for irrigation to the lands lying in the arid zone of its lower valley. Twenty years later powers were provided by Parliament for the construction of a canal on the north side of the Murrumbidgee, to serve the first great irrigation project to be carried out in New South Wales.

This worked well for some years, but later it was seen that a much larger supply must be forthcoming. This necessitated the construction of a huge dam for the purpose of storing a large quantity of water, which forms the chief feature of the present scheme.

The catchment area above the site of the dam is about 5,000 square miles with an average rainfall according to position of from 18 inches to 63 inches per annum. The site of the dam is an admirable one for purposes of storage. On either side the hills rise steeply to a height of about 2,000 feet above the full supply level. At about one mile above the Dam the gorge opens out into a large basin, which formerly included the junction of two rivers. When the Dam is full the area of this portion of the storage will be about 3,500 acres, with a depth of water over a large portion of from 130 feet to 150 feet. Above this basin, the rivers again enter the hills, opening out into smaller areas of submerged flats here and there, which afford considerable additions to the storage. Some 13 miles above the Dam the Yass River joins the Murrumbidgee, water will be eventually held up the Yass River to

22 miles, up the Goodradigbee River to 15 miles, and up the Murrumbidgee River to 41 miles Above the Dam. The total capacity of the Dam is estimated at 33,612,671,000 cubic feet, or 771,641 acre feet.

In point of view of storage the Burrinjuck Dam of this Murrumbidgee Scheme ranks fourth among the great dams of the world, as will be seen from the following table :—

Name of Dam	Capacity in acre feet	Volume of concrete in wall (Cub. Yds.)
Elephant (U. S. A.)..	2,600,000	500,000
Assovan (Egypt) ...	1,865,000	1,179,000
Roosevelt (U.S.A.)...	1,279,362	342,500
Burrinjuck (Australia)	771,641	374,000

The Burrinjuck Dam has a maximum height of 240 feet with a base of 160 feet thick, tapering to 18 feet at the top.

I need not go into details about the Diversion weir, the main canal, the distributing channels, the roads and other works necessary for the development of the irrigated farms. Suffice it to say that the scheme has been a great engineering triumph, people are going in large numbers to an area where a sufficient water supply is assured to them and drought and famine are unknown, and a dry, formerly uncultivated district has been transformed into a veritable Garden of Eden.

THE FARMS AND FARMERS.

From time to time farms are made avilable varying from 2 acres to about 250 acres. Included in these areas are blocks intended for residential purposes, fruit growing and dairying. Each farm has a definite number of water rights attached to it. The tenure is perpetual leasehold. Rents vary from 7 shillings to 25 shillings (Rs. 3—8 to 12—8) per acre depending upon the quality of the soil and the use and position of the land. Any male person not less than 16 years of age, or female not less than 18 years, it not subject to any special statutory disqualification, is eligible to apply for land on the Irrigation areas, or acquire same by way of transfer from a private person. A condition of residence is attached to each block. The whole purpose of the undertaking is not to make money on the part of the Government, but to establish people on the land on most advantageous terms for the development of the country and the good of all.

The range of products is very interesting : The results obtained at the Yanco Government Experiment Farm (which has been established for about 10 years) have demonstrated in the most practical manner, that, with irrigation, the soils and the climate are capable of producing profitable crops of peaches, apricats, nectarines, prunes, plums, pears, apples (certain varieties), almonds, melons, cantaloupes, and citrus fruits; also wine and table grapes, raisins, sultanas, currants, figs, and olives. All of these thrive under irrigation in this region : the quality of the fruit being equal to anything to be obtained on the Australian market.

Parts of the areas are adopted for the production of lucerne (alfalfa). There are other fodder crops also which do well on these soils: wheat, oats, barley, sorghum, maize, millets, and other cereals and grasses.

In addition to these products there are great opportuuities on these irrigated areas for the dairyman. It is expected that the predominant industries will continue to be dairying and fruit-growing. For these the conditions are excellent. With fodder crops of the most profitable kind, to supplement the natural pastures, aided by conditions of climate, and what may in addition be done by man, dairy cattle may be made to give the best possible returns. Butter of the highest quality is produced there.

The Commission's Butter Factory at Leeton, the township for the Yanco Irrigation area, is one of the finest in Australia, being spacious and appointed with all the most modern details of plant and having a capacity for the expeditious handling of the milk and cream of 10,000 cows. The factory takes all the cream produced, and cash is paid for it monthly, thus ensuring for the farmer an immediate and regular return for his industry.

The Government assures to the settlers a ready market for all their products. The pig-raiser's industry has become a very important adjunct in the development of the scheme, particularly as a bacon factory has been erected to handle the output of the areas. At this factory as an instance of a ready market the Government purchases the pigs outright from the farmers.

Vegetables can be made to provide the settler with a source of revenue during the early years of the development of his farm. This particularly applies to such crops as peas, beans, and tomatoes. A second canning factory, one of the largest in Australia, has recently been established at Leeton. These factories treat both fruit and vegetables.

Every assistance is given to settlers by the Commission, such as—advances in money, or the equivalent in materials, trees, or seed; fruit trees and vines may be purchased from the Commission's nursery. Assistance is also rendered in the purchase of dairy stock; brood sows and boars are supplied on terms; and horses and even pedigree bulls may be obtained from the Commission. Experts in dairying, fruit growing, and other branches of farming, also irrigation, are employed to advise settlers free of cost in up-to-date methods.

This briefly is the story of the great Murrumbidgee Irrigation Scheme, in which a wise Government offers liberal and practical assistance to settlers on easy terms. Special conditions and assistance are promised to returned soldiers. The advantage of this water scheme are worth noting.

The whole scheme has been created and is administered by the State Government, and the products are carried to markets on Government owned railways.

Experts are always available to advise settlers free of cost regarding agriculture and irrigation. The climate of the Murrumbidgee Irrigation areas is dry and healthy. Farmers may engage in orcharding, dairying, pig farming, general farming, vegetable growing, viticultural work, stock raising, poultry farming, and bee keeping.

The Government has built the great Burrinjuck Dam, created extensive irrigated areas, and now the people may select and cultivate a farm where drought and famine are unknown and where good markets are assured.

ARTIFICIAL SILK INDUSTRY IN FRANCE.*

THE relative scarcity and high prices of silk and other textiles are at the bottom of a renewed interest that is being taken at present in the manufacture of the chemically-produced textile material known as artificial silk.

It was without any idea of filling a world demand that in 1855 Audemars, at Lausanne, Switzerland, took out his patent on a vegetable fibre for use in incandescent lamps. In 1884 the Count of Chardonnet discovered the collodion thread which he aspired to place alongside of silk in the textile world. But not until 1895 was it possible for the company which he founded to put on the market a thread which was denitrated and consequently less inflammable. Up to 1903 the new industry, interesting though it was, was not seriously regarded in the industrial world, but rather was considered in the light of an interesting novelty. In that year, however, the Societe de la Viscose put on the market the artificial silk which until recently has been the last word in artificial textiles. It may be noted that this company is, in fact, a monopoly and controls the European market very effectively, selling or withholding its goods as it sees fit; only now has the widespread demand for chemical textiles encouraged lesser companies to undertake the manufacture of artificial silks.

On account of the substance which it employs (wood), the new industry has been enabled to adapt itself to any climate. Favoured by groups of Lyon merchants engaged in the French silk and textile industries, who did not hesitate to support the infant enterprise, it has become widely spread throughout the civilised world.

*With acknowledgments to the *Journal of the Society of Arts*.

The production of artificial silk, which in 1902 was 2,000,000 kilos (4,408,000 pounds), rose successively to 5,000,000 kilos (11,020,000 pounds) in 1906, to 6,000,000 kilos (13,224,000 pounds) in 1912, and to 8,000,000 kilos (17,632,000 pounds) in 1914. Germany's production of this article is estimated at 5,000 kilos (11,020 pounds) daily; and France, when the new installations of machinery are completed and material more easily obtainable, will be capable of putting out some 4,000 kilos (8,816 pounds) per day. As in other French manufactures, the lack of fuel and the embarassed transportation services are more serious obstacles than any lack of raw material. While it is impossible to estimate with exactness the total production for 1919, it was assuredly great, but far below the demand.

Progress was checked by the war, while at the same time the demand for the products of the industry was greatly augmented on account of the paucity of all textiles. In spite of the fact that viscose silk is extremely inflammable and cannot resist humidity, uses for it were numerous, during the war, to replace other materials; and it was even found possible to make use of it directly in war work. At Lyons, a cellulose-textile factory, serving as a plant for producing explosives, made sacks of artificial silk to hold powder; and certain parts of the anti-asphyxiation masks used on the front were also made of this cloth.

It is worth noting that the increasing activity of the artificial-textile industry, far from coming into competition with that of the natural silk, coincides with and supplements the growth of the latter. The production of natural silk increased from 19,000,000 kilos (41,876,000 pounds) in 1904 to 23,000,000 kilos (50,692,000 pounds) in 1906, to 27,000,000 kilos (59,508,000 pounds) in 1912, and only dropped to 22,000,000 kilos (48,488,000 pounds) in 1914 because of the war. The difficulty experienced by natural-silk weavers in procuring sufficient material, and the top prices it commands, provide abundant proof that natural silk is more than ever in demand and has nothing to fear from what, at most, is a distant competitor. Viscose silk cannot be obtained in the really fine grades; its use is restricted, for the most part, to such uses as do not subject it to fire and water. In short, taking into consideration that natural silks cannot supply the market, the artificial silk supplements the natural product, but does not compete with it except in the lower grades.

According to a report prepared at the United Stated Consulate at Lyons, a renewed impetus was recently given to the use of chemical textiles by the invention of an entirely new process, the product of which is called silk cellulose. This new form of cloth is claimed to possess a brilliancy comparable to silk schappe, a remarkable solidity and durability, a touch similar to silk, and absolute imperviousness to water; at the same time it is no more endangered by fire than the ordinary natural silks. While the thread of the viscose silks is, of necessity, relatively coarse and thick, the new silk permits of making threads of considerable fineness, and is particularly remarkable for the quality of the velvets which can be made from it. The new process differs radically from the old processes. Instead of converting a thick liquid (the viscose) into thread, it appears that it is possible to preserve the wood fibres and convert them into a brilliant and solid cellulose. As a result of this there is obtained a greater molecular concentration and a regular goemetric form in the elements that make up the thread; all of which, it is claimed, greatly increases the strength and durability of the cloth.

A large factory for the production of the new textile is being projected for large-scale commercial production in the Lyons district, where such materials as velvets, jerseys, satins, draperies, linings, and other silk goods will be woven. Although artificial silks can already be obtained at very advantageously

prices as compared with natural silk, the inventor of the new process claims that his product will be able to reduce still further the cost of chemically-produced threads.

Despite the fact for years to come the artificial textile may not compete with natural silk, yet the producers of the latter must eventually look for advances and inventions on the part of chemists that may ultimately remove the defects now so obvious in the viscose silks. What is most needed is ability to spin a much finer thread, which is at present extremely difficult an account of the air which is held in the coagulating bath in which the artificial threads are formed. Seven or eight years hence, when there has been time for a surplus of artificial silk to accumulate on the market, by reason of the establishment of new plants and increased production of other textiles, those whose interests are bound up in the artificial silk industry will be forced to bring about new developments in order to enable it to hold its place; at that time real competition may be looked for between natural and artificial silks.

The following data have been made public as technical means for determining the various sorts of artificial silks:—Sulphuric acid glycerinated: pure glycerine, 10 cubic centimetres; distilled water, 5 cubic centimetres; concentrated sulphuric acid, 15 cubic centimetres. Iodo-ioduret of potassium: iodide of potassium, 0·3 gramme; water, 30 cubic centimetres; iodine in excess. Chloroioduret of zinc: chloride of zinc, melted, 1·75 grammes; water, 30 cubic centimetres; iodine to saturation. Concentrated sulphuric acid; chromic acid, half saturated; solution of caustic potash at 40 per cent; ammoniacal copper oxide: ammoniacal nickel oxide; a glycerinated and alkaline solution of copper. An acid solution of diphenylamine, 1·57 grammes; concentrated sulphuric acid, 25 cubic centimetres.

The ammoniacal preparation of copper oxide is prepared by dissolving the copper oxide in ammonia in saturation, then passing through the solution a current of air from which the moisture has been removed by passing through a solution of caustic potash.

The ammoniacal solution of nickel oxide is prepared by dissolving 2 grammes of nickel sulphate (crystallised) in 30 grammes of water, precipitating the nickel by means of caustic soda, filtering, and then redissolving the precipitate in ammonia. The alkaline and glycerinated solution of copper is prepared by dissolving 3 grammes of copper sulphate in 30 cubic centimetres of water, with 1·75 grammes of pure glycerine, then adding enough caustic potash to precipitate the copper and redissolving.

There are five kinds of artificial silk: Nitrated silks, collodion silks, the viscose silks, the acetate silks, and gelatine silks.

In calcinating a fragment of the silk in a small test tube, in the upper part of which has been placed a piece of red litmus-paper, the calcination, in the event of the silk being of the gelatine variety, will produce ammonia vapours which will turn the paper blue. There should be, further, the familiar odour of burnt horn. When calcinated, the four other kinds of silks emit vapours which turn the blue paper red.

The silk of the acetate variety, when treated with glycerinated sulphuric acid, takes on a yellow colour with iodo-ioduret of potassium and also with the chloro-ioduret of zinc.

The silks of nitrocellulose, of the viscose silks, dissolve rapidly in sulphuric acid concentrated cold; the cellulose silks dissolve slowly. All three dissolve little by little in cold chromic acid, and rapidly if the acid be heated. The three, and the acetate silks as well, swell up in a solution of caustic potash; while in the same solution the gelatine silk dissolves rapidly and completely.

In the ammoniacal solution of copper oxide, the collodion and viscose silks begin by slowly swelling and then dissolving; while

the acetate silks swell without dissolving, and the gelatine silk turns a bluish violet and does not dissolve.

With ammoniacal oxide of nickel the artificial silks swell without dissolving, except *that the gelatine silk turns brown without* dissolution or swelling.

The glycerinated and alkaline solution of copper does not have any effect on the artificial silks even after a prolonged boiling, excepting upon the gelatine silks, which are *rapidly dissolved.*

The solution of diphenylamine gives a pure blue colouration to the nitrocellulose silks alone; the colouration is most intense at the end of five minutes and fades little by little thereafter.

Care should, of course, be taken to make tests at the same time with silks of known varieties for purposes of checking and comparison. Should the silks have been dyed, the colour should be taken out with hydrosulphite.

An important trade mission, including not only cotton-spinners, manufacturers and merchants but also representatives of the trade unions concerned, will be sent form Lancashire to India and the Far East in October, to inquire into the prospects of exports of cotton goods. The cost of the mission will be about £18,000, and the Treasury has offered to contribute £3,000 if the remainder of the money can be found in Lancashire. The cotton control board which when its work came to an end at the close of the war held funds to the extent of about a million sterling, is likely to complete the amount required. The project is stated to have the support of Mr. Ainscough, the senior Trade Commissioner for India and is likely to be followed by other missions of a kindred character.

ON THE DUTIES OF CO-OPERATORS.

By K. H. Ramayya, B.A., Bar-at-Law.

THE theory of co-operation is said to be that an isolated and helpless individual can develop himself to the fullest extent of his natural abilities by associating with others and by moral development and mutual support gaining all the advantages which are held by wealthy and powerful individuals. The chief object of the introduction of Co-operation in India was to bring relief to the masses who were steeped in ignorance, poverty and superstition. It was found that the economic condition of the peasants showed no improvement in spite of the rapid growth of commerce and railway and other communications, that agricultural methods had not improved and that usury was rampant in villages. The rural classes as a whole were conservative with no desire for education or advancement due to a resigned acceptance of existing conditions and to absence of ideals for the future. To such a stagnant Indian society, co-operation came as a boon. But, though Co-operative Societies have been flourishing well in India, and more so in Mysore, very few people have understood that the Co-operative movement as a whole is essentially a moral one and that it is individualistic rather than socialistic. The mere starting and working of Co-operative Societies do not bring about the amelioration of the masses, if they forget to recognise the moral aspect of the question and if the members thereof are quite ignorant of the true principles of co-operation.

The first duty, therefore, of co-operators is to understand the main principles. I quote here for your information some of the principles recorded in the Report of the Committee of Co-operation in India *viz* :—

"(1) That the object of co-operation is as much to encourage savings as to grant loans on reasonable terms.

(2) that the success of the Societies depends on the mutual knowledge of the members and the exclusion of bad characters,

(3) that the liability of the members is joint and unlimited,

(4) that loans must be properly used for the objects for which they are sanctioned,

(5) that the repayments must be punctual and genuine,

(6) that the powers of control vested in the general meeting should be known to the members, and

(7) that the sources of funds and the constitution of the central financing agency as well as its relation to the society should also be understood by them."

The express object of a Co-operative Society being the development of thrift among its members it should be very careful in selecting as its members honest men who intend to benefit themselves and at the same time afford facilities for the benefit of others. The loans granted by the Society must, therefore, be in no circumstances for speculative purposes, but, on the other hand, care should be taken to see that the loans are as far as possible used for genuine productive purposes. As Co-operative Societies are training grounds for our practising the art of self-government, it is the duty of every co-operator to see that there is always danger in excessive exclusiveness and that no deserving but poor persons are excluded on the ground of their caste or status. In fact, all the members of a Co-operative Society should feel as members of a large family possessing mutual rights and duties.

It is not enough that societies are merely *Co-operative*, they must also be *business-like*. The Board of management must consist of experienced men of different walks of life, who are willing to give their services to it gratuitously. The ultimate authority must not be given over to the office-bearers, however able and experienced, but it must rest in the hands of the members who must always take practical interest in the business of the Society. Every member must feel it his duty to attend the meetings regularly and effort must be made to be as far as possible punctual in attendance. As a matter of duty, every member who for one reason or another is unable to attend the meeting must make it a point to write a letter to the Secretary not only to make him aware of his inability to attend the meeting but also as a matter of courtesy not to make the other members unnecessarily wait for him. If this simple rule is followed by the members, much business could be transacted without waste of time and without adjourning meetings for want of quorums as is usual in the case of many of our meetings. It is also good to observe punctuality in the case of repayments of loans as they fall due. As the constitution of the Societies is truly republican, each member having one vote and no more in the general meeting, each member should play his part freely and well. Whenever loans are given, the committee and members should keep a vigilant watch and see that the money is expended for the purpose for which it is granted. The office-bearers should also see that proper accounts are maintained by the clerical staff and that they are now and then checked by competent auditors.

As much of the executive work of a Society falls on the Secretary, it is the duty of the members to see that a capable and earnest worker of broad sympathies should be chosen for the post. When once he is chosen for the responsible office, he should be given every latitude to do his onerous work unhampered by unnecessary and useless criticisms. If, after having been given a full opportunity, the Secretary is found to be incompetent or undesirable, he should be removed quickly and a competent man appointed in his stead.

In matters of business, sentiment should not be allowed to play any part.

It should be the constant aim of every co-operator to see that no benevolent institution of any kind, such as, schools, hospitals, etc., in his locality die for want of support. Above all, it is his duty to stamp out ignorance, poverty, disease, etc., from the place where he happens to reside. For this reason, he should endeavour to start primary schools, co-operative societies, improve sanitation, and encourage the growth of industries.

Lastly, he should try to take note of the man-power and the womanpower existing in his locality irrespective of caste, colour or creed and try to create opportunities for them to develop to the fullest extent possible so as to enable new, healthy, and prosperous conditions to come into being in the place in which he happens to reside and carry on his business.

BRITISH EMPIRE FORESTRY CONFERENCE.

[*The resolutions passed at the British Empire Forestry Conference held in London in July last, and attended by upwards of forty delegates representing respectively the United Kingdom, Australia, Canada, India, Newfoundland, New Zealand, South Africa, the Crown Colonies, Egypt and the Sudan, have been issued as a White Paper, and are to be brought to the notice of the various Governments. The following are the main points*:—*Ed., M. E. J.*]

In view of the great importance to the Empire as a whole, as well as to each of its component parts, of producing a sustained yield of all classes of timber, and of encouraging the most economical utilization of timber and other forest products, and of maintaining and improving climatic conditions in the interests of agriculture and water supply, the Conference affirms that each of the Governments of the Empire should lay down a definite forest policy to be administered by a properly constituted and adequate forest service.

The foundation of a stable forest policy for the Empire and for its component parts must be the collection, co-ordination, and dissemination of facts as to the existing state of the forests, and the current and prospective demands on them.

In order to attain continuity in the development of forest resources, it is desirable that certain elements of stability be secured in the constitution of the forest policy. This may be done by the following measures:—

1. The definition, where this has not been done already, of forest policy in a Forestry Act or Ordinance.
2. The reservation for the purpose of economic management and development of forest land under conditions which prevent the alienation of any which is primarily suitable for forests, except for reasons consistent with the maintenance of the forest policy as a whole.
3. The assurance to the Forest Authority of funds sufficient to carry out the accepted policy for a series of years.
4. The grant to members of the forestry service of the status of civil servants with due provision for pension.
5. The appointment as the chief officers of the forestry service of persons having a high standard of training in forestry, their selection and promotion being by merit alone.
6. The establishment in each of the larger parts of the Empire, and for the Colonies not possessing responsible government collectively, of an officer, or officers, having special duties of advising as to forest policy and surveying its execution.

It is extremely desirable that the Forest Authority should be in close touch and consultation with organizations representing the interests concerned in the extraction and utilization of timber and other forest products.

The Conference have had their attention drawn to the advantages which have accrued in several parts of the Empire from the wide distribution of forest plants, and desire to bring the method of encouraging tree-planting by distribution of plants, either from Government or private nurseries, gratuitously or at cost price to the earnest attention of their Governments.

A scheme of research work received the approval of the Conference, and is recommended to their Governments for early consideration and approval. This takes the form of a report from a Committee dealing with

the organization and sub-division of research with the relation of the different parts of research to one another and to education and practice, and with the subjects of research both generally and in relation to the needs of the different parts of the Empire.

It should, the Conference declares, be a primary duty of Forest Authorities throughout the Empire to establish systematic schemes of forestry education. It has been found, for climatic and other reasons, that it would not be possible for each part of the Empire to establish a complete scheme of forestry education of its own, and, therefore, it is essential that those parts of the Empire which are willing and able to establish complete systems should, as far as possible, frame such schemes with a view to combining for meeting the needs of those parts which can only themselves make a partial provision for their requirements.

Part of this subject has been dealt with by another Committee, whose report embodies the following principles:—

1. That one institution for training forest officers be established in the United Kidgdom.
2. That students be selected from graduates having taken honours in pure or natural science at any recognized University.
3. That it be an integral part of the work of the institution to arrange supplementary courses at suitable centres for students requiring special qualifications, and also special courses for forest officers from any part of the Empire, whether at the institution itself or at centres of training in other parts of the world. The Governments should recognise these courses as part of the ordinary duties of the forest officer, at any time during their service, and the Governments concerned should give special facilities to forest officers in their service to attend such courses.
4. That a department of Research into the formation, tending and protection of forests, be associated with the training institution.
5. Encouragement should be given to the existing provision made by Universities and Colleges for forestry instruction for those who do not desire to take the full course suggested for the forestry service. It appears that this is especially applicable to the United Kingdom.

It is also desirable to make adequate provision for woodmen's schools for the training of foresters as distinct from those which are intended for forest officers.

The Conference also approved of the suggestions and recommendations for the constitution of an Imperial Forestry Bureau which are contained in the report of a committee. The delegates feel that it must be upon the work of such a Bureau that the proper development of the forestry resources of the Empire will largely depend, and they therefore, cannot over-emphasise its importance as a part of Empire organization. The following questions should be referred to the Bureau immediately on its formation:—(i) Standardisation of forest terminology; (ii) correct identification of timbers, and standardisation of their trade names. The total sum required will not be less than £10,000 per annum during the first five years of the Bureau's existence. It is proposed that the different Governments shall contribute on the following basis: United Kingdom, 25 per cent of the annual expense; British India, 25 per cent; Self-Governing Dominions, 25 per cent; Crown Colonies and Protectorates, 25 per cent.

The delegates recommend that the next Conference be held in the year 1923, and that, if the Dominion Government approves it be convened in Canada.

WEST COAST INDUSTRIES.

BY S. R. RAO.

THE passage recently through the Imperial Legislature of a measure validating the transfer of what used to be known as the Basel Mission Industries to a quasi-philanthropic body known as the Commonwealth Trust Limited draws attention to the very great possibilities of Indian industrial development under the direction of well-managed philanthropic societies—or alternatively under properly conceived system of State aid and direction. Both methods have been worked successfully on the west coast, the former in the case of the tile-making and weaving industries, and the latter in the Government fish and soap factories, the work of all of which industries is of the greatest importance alike from an educational and an economic point of view. Hardly any part of India is as highly favoured in the matter of economic resources as the West Coast, particularly the districts of North and South Malabar and portions of South Canara, but with a few exceptions, notably in the case of the planting districts and the work already noted of the Basel Mission, little has been done till comparatively recently to tap these resources. The latter work originated as long ago as when a printing press was started, with the twofold object of providing work for the converts of the Mission and of publishing in the vernaculars the gospels and other christian literature. That press we may say in passing is now one of the most up-to-date and best-equipped in the Southern province. From this small beginning grew other industrial ventures, notable among which are the tile-making factories amongst the best of their kind in South India. The tile industry was started in 1865 on a small scale, with a hand-press, and later in 1881, steam power was introduced with a great increase in out-put. The tile made at the Mission factories are of high quality and are supplied to the Government Public Works department. At first only flat roofing-tiles were made, but now at the Jeppoo factory ridge-tiles, both plain and ornamental, sky lights and ventilators, ceiling tiles, flour-tiles, etc., are made. The daily output of the various factories is now as much as 60,000 and their market includes Ceylon, East Africa, the Persian Gulf, the Strait Settlements, Borneo and even Australia. Hardly less important than the tile-making industry started by the Mission is their weaving establishment, famous throughout India for its "calicut checks." It is interesting to note, *en passant* that it was here that the dye now known as *khaki* originated having been discovered by a Mr. Haller, a Missionary associated with the dyeing department of the Mission, and recommended for use by the British Army by Lord Roberts when on a visit to Mangalore. The industry has now been considerably developed and employs over 1,500 workers. In the case of this industry as of the tile-making industry an important result has been that the success of the mission ventures has resulted in the starting of a number of private factories, some of them eminently successful—a result perhaps even more important than the success of the original venture, since it shows that Indian enterprise is not slow to respond to the stimulous given to it by a successful pioneer industry. Other departments of the Mission's work include a large mechanical engineering establishment and a carpentry department, both of which are doing very good work, and incidentally providing a field for the training in arts and crafts of the people around. After the outbreak of the war, the Mission industries which were largely under enemy alien control seemed in eminent danger of extinction but it has been found possible to continue their work in spite of the vicissitudes through which they have passed, and now under the control of the Commonwealth Trust Board, a quasi-philanthropic body, with an eminently sound

direction, they have a great future before them, and are capable of infinite expansion.

So much for the work of the Basel Industrials. Having seen what may be accomplished by a quasi-philanthropic body, we may turn to see what can be done by properly regulated state-aid. The work of the Fisherries Department in pioneering the fish-oil and guana industry, which promises in the future to be an industrial asset of the greatest importance to the West Coast is a great achievement. The Department was originally started with the object of teaching new and sanitary methods of fish-curing and generally demonstrating to the fisher population on the west coast the best way of utilising their great natural resources in this field. The fish-curing work still remains an important feature of the departments activities, and from it indeed has sprung an important canning industry, which has incalculably great possibilities before it; but the manufacture of fish-oil and guano is even more important. Sardines in their season are so plentiful on the West Coast that they used it in the past *as natural* manure. The presses of the department now extract a valuable industrial oil from these fish and use the residue as guano—a manure greatly in demand not only on the plantations of the West Coast, but much further afield. For both the oil and the guano there is an almost unlimited demand, and the success of the Government venture is proved by the fact that there have now sprung up all over the West Coast innumerable small private factories which are, we believe, doing very well from commercial point of view, though from their nature they are a great nuisance to the general public. A very important feature of the Department's activities in the West Coast is the educational work among the moplah fisher folk, better to a crude and educated people, but who have now come greatly to appreciate the night schools, Co-operative Societies and other benevolent institutions started among them by the officials of the Department. We have already alluded to the fish-cunnery started by the department. Not less important is the Soap-factory, which however is under the direct control of the Department of industries. Here vegetable soaps of all types are made, from the cheap bazaar product to high-class toilet soaps hardly distinguishable from the wares of Western perfumers but in all cases of guaranteed purity. Here again, if justification of the Government venture were needed, it would be found in the numerous private soap factories which have been started in the neighbourhood, many of which are already making excellent profits. We think we have written enough on the foregoing lines to show that on the West Coast at any rate it has been abundantly proved that private enterprise in India responds freely to the stimulus given by pioneer industrial work undertaken by Government or private philanthropic societies. A good deal more might be written of the good work of the Fisheries Department, for which great credit is due to Mr. Frederick Nicholson its eminent chief and founder and his able assistant Rao Bahadur K. N. Govindan, but our aim has been not to enter into a detailed study of the technique of the work, but to indicate the eminent success of the Departments' liberal policy.

The number of motor-cars imported into India during the four months, April to July, 1920, was 5,292, valued at Rs. 19,500,000 as against 1,474 valued at Rs. 4,100,000, in the corresponding period of 1919. Of these 5,292 cars, 4,015 were shown to have come from the United States, 616 from the United Kingdom, 510 from Canada, 35 from Italy and 10 from France. The country of origin of many cars shipped from the United States is, however, Canada. Bombay imported 1,983; Bengal 1,860; Madras, 710; Burma 396 and Karachi, 373.

EDUCATIONAL RECONSTRUCTION IN INDIA.*

BY C. R. NARAYANA RAO, M.A., L.T.

WE must state at once that the title of this little book is distinctly misleading. What we find in it is not any constructive scheme, but rather the hackneyed criticisms on the existing system together with somewhat cheap and impracticable proposals.

The Educational problems in India are reviewed in the five Essays which comprise the book. The principal defect of the system of present education is, according to the author, that it is controlled by the state and accordingly its "tendency has been to become progressively unreal, so that to-day it is a machinery which stunts our growth, a mass of unreality expressing no meaning and capable of expressing none, a system which tortures us by its elaboration and kills our mind and soul by its barrenness." We honestly doubt whether education really would have progressed in India to the extent it has to-day if it were left entirely under the popular control. Well, Education is one of the transferred subjects under the Reform Scheme and Nationalists politicians have a chance of establishing in India through their Indian Minister what they call " National Education"—whatever that may mean. What Indians want is neither "national" nor "State-ridden Education," but one which teaches them things that concerns them most *to do*. For the purpose of founding national schools and colleges, the author examines the claims of different languages, for the adoption of one of them as the common language of India. He concludes that Hindustani has the strongest claims in this direction,"—"the language which the ordinary man speaks in Northern India"—and this is to replace English as the medium of instruction. This proposal, the author maintains, will not affect the vernaculars, and we suppose that it is applicable to women's education also. The Government of the country being British, English also in conceded a place in this scheme on a level with the vernaculars. Well then the position is this. A Dravidian or an Andhra boy has got to learn Hindustani his first language, then English and his own particular vernacular together with such other subjects as the National School will instruct. Without National Schools, he had to do two languages and now three! The main objection to the use of English as the medium of instruction is that it is a foreign tongue whose understanding entails considerable loss of time and mental energy and after all the mastery is only very imperfect. All this argument may be hurled against Hindustani and even the vernaculars. The Indian youth at college understands his English text-books far more easily and readily than his Vernacular books which have been written in a language and style quite foreign to the mind of the average student. Assuming that we succeed in mastering the vernaculars of our text-books, can we impart instruction in the Western sciences and philosophy through our Vernaculars. Assuming too that we succeed in translating the scientific books in our vernaculars, can a student trained in this fashion participate in research or applied work of any importance, can he follow the methods of work in Europe or influence them to any extent through his vernaculars. The case of Japan is cited in this connection. The Scientific literature of Japan to which we have access is all in the European languages and the Journal of the College of Science, Tokyo, will bear out what we say. We are not, however, to be understood as being hostile to the proposal of the adoption of vernaculars as a medium of instruction in our schools. In fact this is being tried with mixed results in our Anglo-Vernacular Lower Secondary Schools in the State and they by no means justify the whole sale use of vernaculars in our colleges and universities.

We are one with the author in his criticisms against the universities in India they have made a fetish of the examinations but

* "Essays on Educational Reconstruction in India" by K. M. Panikkar, B.A. (Oxon). Ganesh & Co. [Mad]ras, 1920.

unfortunately we are not in a position to substitute any better test. It is true also that the universities have not hitherto provided research work, but we see that a change is coming over and already the output of work from our universities is becoming recognized. Many people in India may not agree with the author in his statement that a classical revival must be the very base of an educational reconstruction," but all will surely agree that Indian classics should be promoted in our universities and the Madras University has just begun to give increased attention to the ancient classics. The chapter on the training of children contains some pious instructions for the parents to whom they may not be new but are too expensive or out of his reach otherwise for adoption.

The trouble with Education in India is this. Our present classes have become much too large for efficient instruction. In the nature of things, it is impossible that all these students can be fitted for higher University work. Such an attempt is not made in any other part of the world. You have got to recognize, at some stage in the education of our youth, those fitted for higher academical work and others not. The former alone should proceed to the University and the latter to the Government offices, the industrial factories and work-shops, back to the land, to the army and the navy, to the banking and trade concerns, to the Railways, Telegraph and postal departments which require a certain amount of mental training to understand the departmental technique and in which a University degree with higher training in science or humanities would be sheer waste. The learned professions should be the proper field for our university graduates and the whole trouble, to our mind, well even the communal trouble, we mean, will disappear if equal opportunities are created for both these classes of men to become rich and influential in their own country. Wealth and power we contend for through University Education and if we can get both in an equal measure in ways other than a University degree, then there ought to be reasonable contentment and peace among the different communities. This problem is not beyond the reach of practical statesmanship, and if there is the real national problem we are certainly one with the author.

The book is written in a bright style but does not go to the root of the evil.

ECONOMICS IN THE WEST.

Industrial Conditions of the Hour.

London, 19th August, 1920.—There are many evidences that the boom in trade which set in after the Armistice is slackening. Short time is becoming the rule in not a few trades and there is growing unemployment in industries which a short time since were working at high pressure. It is possible that this depression is only a passing phenomenon due to purely temporary causes such as the shortage and high price of coal and other raw material, the temporary satisfaction of the most pressing of the world's needs for manufactured goods, and the erratic course of exchange which makes commercial transactions difficult. But it is idle to disguise the fact that the conditions of the world, and especially of the European world, at the present juncture are such as to offer no strong hope of a sustained and prosperous trade. Here at home at this moment we are beset with difficulties of the most menacing kind. The miners have put forth demands which if conceded will add an intolerable new burden to industry, and which if rejected will percipitate a strike which will paralyse the country's trade. At the same time there is proceeding what is to all intents and purposes a revolutionary movement with Bolshevist affinities calculated to test to the utmost the patience and strength of the nation and to divert it from the work of reconstructiou if it does not produce any more serious consequences. So disturbing indeed, is the outlook that he must be an optimist of the most convinced type who can discern any favourable development offering in the industrial conditions of the hour. Nevertheless, we must not take too trajic a view of events, black and unpromising as they unquestionably are. A study of history teaches us that what we are experiencing to-day is the inevitable aftermath of a great

war in which the social and industrial fabric was shaken to its foundations. Just a century ago England was passing through just such a crisis as it is experiencing to-day. Then as now revolutionary ideas were rife and *constitutional authority was flouted.* "Direct action" which to-day takes the comparatively harmless form of setting up local committees in imitation of the Russian soviets a century since assumed the far more dangerous character of riotous combinations which broke up machinery and burnt ricks and destroyed crops. We weathered the storm then and I am convinced that we shall weather it again and probably date a new era of national prosperity from the existing upheaval as we did from the storm which swept the country after the Napoleanic wars. But the next few months are not going to be an easy time for any one and least of all for our manufacturers who are daily feeling the increased pressure of foreign competition.

As far as the miners are concerned the threat of a strike excites far less apprehension than a similar menace has ever done in recent times. In point of fact there is quite a considerable body of industrialists who would welcome rather than otherwise a trial of strength on the issue which the miners have raised. The feeling is that a collision is inevitable and that as it has to come it would be better to have it at once and settle once and for all whether the community is to be subjected to the veiled system of blackmail under which it has so long groaned. The effect of a stoppage of the mines would be far reaching and the financial loss would be colossal. But the belief is that the ultimate result of the conflict would be to create more stable conditions in industry generally by opening the eyes of the workers to the fact that they are and must be the first and worst sufferers from revolutionary movements whether in the form of general strike of miners or of a "direct action" movement by the Trade Unions. It is certain at all events that we have already reached the extreme limit to which wages can be forced consistent with the maintenance of industry on anything like a profitable basis. The inflation of wage remuneration has been carried in some directions to quite ridiculous lengths. I was told the other day of a case in which in a large electrical manufacturing undertaking a man who merely fused wires—a quite elementary process—earned more money weekly than the engineer in charge of the entire business. There are men in the tinplate trade who draw as much as twenty pounds a week and an instance was given not long since of a family in the cotton trade whose united emoluments reached £1,500 in a year. In extraordinary times such as those we have just passed through when the world was clamouring for manufactured goods and was prepared to pay almost any price for them high wages were no serious detriment to the country. But it requires no expert knowledge to understand that they cannot be continued indefinitely without limiting sales to an extent which in the long run must be ruinous to an industry.

THE MOTOR INDUSTRY.

The motor industry here is much perturbed at the action of the Ford Company in revising their scale of charges for cars on a basis intended to "cut" British prices. Coming as this procedure does at a time when home manufacturers are struggling with unexampled difficulties arising out of the increased cost of raw materials and an ever ascending wage sheet it has excited lively apprehension at the possibility of the industry competing successfully with the American cars. It is realised that the element of cost is a decisive one with a large class of buyers and that many orders which under other conditions would be placed at home will now go abroad. The satisfactory feature in the situation is the leverage which the superior efficiency of the British engine gives for obtaining business where price is not the only consideration which influences buyers. In these days of

excessively costly petrol economy in consumption is a highly important factor and in the long run it may outweigh the element of cost in the purchase of a car. Therefore, it is believed that though temporarily British cars may be placed at a disadvantage by the action of the Ford Company they will in the end assert their pre-eminence. For the better make of cars—the highly expensive productions which are acquired by those to whom money is no object the British manufacturer has a market which is peculiarly his own. The leading firms have more orders than they can deal with and the waiting lists are long. In connection with this demand for high grade cars I heard a day or two since a singular story which has the merit of being perfectly true. One of the new rich fraternity who have made fortunes by the war was especially anxious to obtain a Rolls Royee car of the highest grade. The manufacturers were unable to hold out any hope of even a moderately early delivery and sent him away disappointed. Chagrined at his failure he set to work to satisfy his needs in another way. Walking down Bond Street one day he saw a splendidly appointed Rolls Royce car draw up at one of the fashionable shops in that famous street. Approaching the owner driver of the car he asked him if he wanted to sell his car. The gentleman thus approached resented the question as an impertinence and with an emphatic "no" quickly entered the shop. On his return to the street a little while later the would—be purchaser again approached him and with an apology for his pertinacity said "I particularly want a car: I will give you £7,000 for yours if you will sell it." Taken aback at the character of the offer the owner hesitated and his interlocutor added: "You need not be afraid that I shall be unable to finance the transaction: if you will drive with me to ————'s (mentioning a famous bank) I will satisfy you as to my *bona fides* and if you desire it, pay you the money down." The owner, who was not above making a heavy profit on his original purchase, asked his questioner to enter the car and the two drove to the bank where the deal was finally carried through, the new owner driving away in the car in triumph. There are, of course, comparatively few people able to pay £7,000 for a motar car even in these times when, as the income tax satistics prove, the number who are liable to pay super tax is so much larger than it was before the war. But wealth and especially wealth of the new type was never more intent on having the best that the world offers in the way of luxurious accessories and for this reason the high grade British car more than maintains its ascendancy.

THE EMPIRE COTTON GROWING COMMITTEE.

India is, or should be, greatly interested in the details of the scheme for the future organization of the Empire Cotton Growing Committee which have just been published. This enterprise, as will be remembered, aims at stimulating the growth of cotton in British possessions and if possible making Empire self contained in the matter of raw cotton. During the war we felt actually the disadvantages of drawing our supplies of cotton largely from foreign territory and even now the drawbacks of the system are seriously incommoding our trade. With proper methods of cultivation and organization there is no possible reason why every pound of cotton used in British manufactures should not come from British sonrces. The Association now started on its career ought to do much to hasten the accomplishment of that desired end. Its funds, derived partly from Government grants, partly from subscriptions from the Cotton Trade, are adequate to the financing of arrangements eminently calculated to produce practical results. There is to be a well organized central establishment at Westminister, with a representative Executive Committee to carry out the policy which will be decided by a general Administrative Council

representative of the various interests concerned. The executive work will include research work, training facilities, correspondence, advice and information abroad, the maintenance of relations with cotton growing countries of the Empire, and the organization and carrying through of pioneer work in suitable areas. It is anticipated that the more important members of the Imperial group such as India and the Dominions will prefer to finance their own activities; but no doubt is entertained that the scheme will be welcomed, especially in the tropical areas of the Empire, because of the promise it holds out of increased production of superior grade of one of the most valuable staple products of industry.

IMPORTANCE OF RESEARCH WORK.

How important research work in connection with economic products is, is aptly illustrated by a report of the Imperial Mineral Resources Bureau which has just been issued. Dealing with arsenic, Fuller's earth, chrome ore and magnesite, the report shows in a vivid way what value attaches to original sources of the supplies of these products and how necessary it is to make the most of them. Arsenic, for example, which cost only £13-12-6 d per ton before the war was sold at as high a price as £145 per ton in February 1918. In the United States the production of the drug has risen from 2,280 tons in 1913 to 10,275 tons, an output in excess of that of the entire British Empire to-day. It is interesting to note that this increase has not been made possible by the opening of new sources of supply, but by the recovery of waste arsenic from iron smelting fumes and the transformation of what was a public danger into a valuable product. Chromium Ore is a product of immense importance in the production of special classes of the munitions of war such as armour plates, and recently it has been employed with advantage in the production of steel which does not rust when attacked by print acids, sea air or salt water. Before the war Rhodesia and New Caledonia between them supplied the bulk of the world's consumption. Now Canada and India are drawn upon for a large portion of the home consumption of the ore the former contributing 33,000 tons and the latter 50,000 tons in the year.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Thick Cotton Spacing.

Washington, D.C., U.S.A., Aug. 19, 1920.—A large number of government experiment stations are publishing the results of tests on thick spacing of cotton, as opposed to the old system of wide-spacing. Without exception, they demonstrate the value of thick spacing, or the single-stalk culture system, that has been advocated by the United States Department of Agriculture for several years past. Some of the agricultural journals are commenting on the reports of the experiment stations, and, while they advise planters to adopt the thick spacing system, they believe that the old system has become so thoroughly established that its overthrow will be difficult.

That there may be a proper understanding of the scientific principle on which the thick-spaced method is based, department specialists have attempted to make that clear in a statement just issued, and which should prove interesting to readers of the "Journal."

Cotton produces more lint when it is thick in rows than when it is thin in rows because of a somewhat unusual branching characteristic. The cotton plant puts out two kinds of branches—short lateral branches that bear fruit and long, heavy, vegetative branches that are, in effect, secondary stalks. These vegetative branches finally put out lateral fruit branches, but they require a long season in which to do it. Under adverse conditions, such as draught or boll weevil infestation, they do not produce cotton, because their fruiting season is so late that the adverse condition, whatever it may be, frustrates it.

If cotton is sufficiently thick in the row the plants put out only fruiting branches. There is no room for the vegetative branches to grow. Therefore, mere plant growth is

restricted and the vitality of the plant goes argely into lint production. The result is that the bolls are put out and mature much earlier and more profusely than when the plants are far apart, and boll weevil and draught injury are minimized.

Cotton persists in growing thick in the row, no matter how sparsely the original plants may be spaced. Each vegetative branch or secondary stalk is essentially a new stalk of cotton. It grows on the same root stalk, but it takes up as much space, as much moisture, and as much soil nutrition as if it were a separate plant.

Experiments conducted for several years by the Department of Agriculture showed that cotton 3 feet apart is in effect just as close together as cotton 3 inches apart—that is to say, when the cotton is spaced 3 feet apart it puts out enough vegetative branches or secondary stalks to make the equivalent of one stalk every 3 inches. These secondary stalks are not the disadvantage of being several weeks later than the original stalks, and therefore cannot come into bearing nearly so early. This might not reduce the yield during a long growing season, but where the boll weevil has to be contended with the secondary stalks rarely succeed in producing bolls and the entire yield is confined to the portion of the plant above the topmost vegetative branches.

When the plants are thick in the row all the branches are fruiting branches, and the plant consequently produces bolls from bottom to top. More than that, it produces them early and matures them to such an extent that they are practically boll-weevil proof before the boll weevil infestation reaches the danger stage.

Experiments made by the Department of Agriculture some time ago showed that cotton plants 3 inches apart produce a great deal more lint than plants 3 feet apart, and that the same is true of all intermediate stages. In other words, the widest spacing is the worst system, and any narrowing of the spaces down to 3 inches is an improvement. Below that the crowding may be injurious. These results have been confirmed recently by experiments carried on at state stations. Here, for instance, are the results of a series of experiments carried on at the Delta Experiment Station, in the state of Mississippi:

	Pounds per plot
Plants 8 inches apart ...	.. 117
,, 12 ,, ...	... 93
,, 16 ,, ...	... 90
,, 20 ,, ...	... 59
,, 24 ,, ...	... 57
,, 28 ,, ...	... 56
Unthinned or left as placed by the planter, average of 2 plots	... 134½

When two plants were left together, at these same distances between the hills, the results were as follows:

			Pounds per plot
2 Plants in the hills,	8	inches apart...	112
Do	12	,, ...	109
Do	16	,, ...	99
Do	20	,, ...	92
Do	24	,, ...	86
Do	28	,, ...	71

It must be remembered by cotton planters practicing the thick-spacing system that another change from the old methods is necessary at the same time. When cotton is spaced far apart it is thinned early. When close spacing is adopted the thinning must be delayed until comparatively late in the season. If the thinning is done early vegetative branches are likely to appear even when the plants are thick in the rows, thus offsetting such advantages as might be gained. It is not possible to fix any definite time at which thinning should be done, but it is safe to say that the plants should be from 6 to 12 inches high instead of from 2 to 4 inches high, as has been customary in the past. Planters who, either by design or because they are unable to get labor for thinning work earlier, postpone their thinning

until late in the season should adopt the single-stalk close-spacing system. If, late in the season, they chop out the cotton to conform with the old-time standard, they run the risk of greatly reducing their yields.

Close spacing and delayed thinning does not mean that there must be no ciltivation until after thinning. Cultivation to control weeds, of course, must be undertaken whenever the development of grass or weeds shows that cultivation is needed.

ROADSIDE TELEPHONES.

Nearly all great inventions—probably barring the mysterious ones of Mr. Edison—simplify the problems of life by means so simple that everyone wonders why he did not hit upon the device. For example, a great fortune was made by the invention of a machine which made wooden screws with points upon them. In these days when any one sees an old-fashioned wooden screw, as large at one end as at the other, for which a hole had to be bored with a bit, wonders why the first man who thought of a wooden screw did not think of threading it to a point.

Now, telephoues are to be installed upon many of the principal public roads and highways of the country for the convenience of travellers. The plan being put in operation is to put up a small booth at each milestone. The motorist or other traveller who is stranded or otherwise comes to grief is then never farther than a half mile from a telephone.

The plan provides so simply for one of the most vexing problems of road travel that it seems that it should have been devised many years ago. The " road telephone " is an institution so obvionsly necessary and essential that it rates with the screw-point as something which should have been discovered and put into use long before it was.

The custom of the last decade of the nineteenth century to hunt up the nearest farmer who would, for a somewhat fabulous price, provide a pair of mules to tow a stranded automobile is in a fair way to be obsolete in this twentieth century. There is always towing service, as well as tire service and other service, within hailing dising distance if only telephone can be reached. That's the big and helpful feature of the road-side telephone plan. Tramping to the nearest farm house—which may be anything but near—which has a telephone is often extremely arduous and wearisome. The motorist, of course, is welcomed sympathetically by the farmer, but very rarely so by the farmer's dogs. And the dogs must be encountered, dealt with and compromised with before their owner can be reached. They form the alert outguard of the rural home.

The *evolutionary outgrowth of the roadside* telephone would be the telephone instrument, carried in the tool-box of the machine, with which the stranded or wrecked motorist could tap any wire at any point and utter his Macedonian cry.

With such an instrument and a trusty pair of lineman's climbing irons with which to run up telephone poles to order gasoline, tubes, casings, tows, and other emergency necessities the tourist would be able to keep in touch with all that frees touring from the burden of anxiety. And this is coming.

MOTOR OILS DELIVERED BY AIR PRESSURE.

Motorists who stop for fuel at many points in the southern part of the state of California get quick and efficient service, and, beside, see the kind of oil they ask for drawn from a row of faucets like fruit syrups at a soda fountain. These stations are said to be the only ones in the world where such an efficient system of handling oils has been installed.

Six standard grades of lubricating oils are stored in tanks in the basement of the service stations, and each of the reservoirs has six pounds of air pressure on top of the oil. Thus the attendant on the street where the motorists drive in, upon receiving an order for a quart or a gallon of oil, takes the

quart or gallon measure and draws it off like taking water from a hydrant. Light oil flows from one cock, medium oil from another, heavy oil from still another, and so on.

The oil is forced through the pipe system by the air pressure which is kept at just six pounds by an automatic electric pump. As the oil is removed and the pressure falls, the mechanism automatically starts the pump and renews the pressure to six pounds.

The amount of oil in each reservoir is indicated by an ordinary boiler gage glass near the base. When a reservoir is emptied the electric air pump is switched off. An air cock on top is then opened to release the pressure and a barrel of oil is poured in through a large pipe by opening the bung over a drain hole in the sidewalk above. The air cock is closed again after the reservoir is filled and the pressure is immediately renewed by the pump.

A New Record in Wireless Telephony.

The cities of New York and Chicago have been put in regular wireless telephonic communication with each other. Robert F. Gowen, of New York, is the man who is making the low-powered wireless telephone come true, and it is the half million members of the American Radio League who are helping him make his experiments successful. These members are scattered all over the United States.

Mr. Gowen is the inventor of the audion lamp equipment and the man who has made vital improvements in the vacuum tubes which are so important a part of the wireless telephone. It was only recently that he had his equipment installed and got ready for the test which would determine whether the one-third of a kilowatt generator and 360 meter wave length he proposed to use would carry the human voice far enough to make the radio telephone practicable.

A year ago, it will be remembered, the United States Navy sent the human voice around the world, 25,000 miles, by using a 300 kilowatt generator and a wave length of more than 3,000 meters. But the cost ran up into the thousands of dollars and made the radio telephone so expensive as to be prohibitive for commercial work at long distances. This was the thing that Mr. Gowen and his enthusiastic half million assistants wanted to correct.

Previous to the successful experiment made between the two great American cities, word was sent that on a certain night at a certain hour an effort would be made to talk without the use of wires from New York to Chicago, 750 miles away. Chicago, R. H. G. Matthews, vice president of the American Radio League and lately in the radio service of the United States Navy, sat at his instruments with the telephone receivers clamped to his ears. Late at night, so that interruption would be less likely, Gowen's voice came over the wires. He spoke of the weather and the difficulties New York was having with a snow-storm. Then he started a phonograph to playing, and, if there had been room in the little shanty on the bleak shore of Lake Michigan, a dance could have been held in Chicago to the music played in New York, so distinctly was the latter heard for many yards around the room. They tried it again the next night, and the next, and for several nights thereafter. Then Gowen called halt, went to bed and slept the clock around. He had worked night and day with only a few hours of sleep for a week.

But the joy of the experimenters was further increased a few days later when Gown received letters, narrating the conversation at he had held and the tunes he had played, from other wireless stations at Topeka, Kansas; Valley City, North Dakota; Battle Creek, Michigan; and Gaffney, South Carolina. Instead of stopping at the 750 miles he was trying to span, Gowen's

small power apparatus had thrown his voice more than 1,500 miles around.

As soon as some slight changes are made in the receiving sets Gowen is going to make an effort to talk with Roswell, New Mexico, and then with San Francisco, on the Pacific Ocean. If he can accomplish this he will know that the radio telephone as a commercial probability in the near future is assured.

Meanwhile, at the Chelmsford Station, near London, England, other experimenters are making daily efforts to talk with America. Unfortunately, the hour which is best for the English experts does not offer the best of conditions in America, and so far there has been nothing to indicate that low-power is sufficient to send the human voice across the Atlantic Ocean.

"But we are on the right track," says Gowen. "We have not yet reached the limit of the eqnipment we are using and any night we may expect to hear the voice calling to us from across the Atlantic."

Operators hearing Gowen "speak" were aware that a new record had heen set in wireless telephony without great power, and a wonderful invention give assurance of great possibilities.

ALFRED T. MARKS.

NOTES.

A correspondent writes to a contemporary:—As regards soap, it is argued that Ceylon is specially well placed for the creation of the industry for the island itself produces the essential oils which would be largely used in the manufacture and not a great deal would need to be imported from outside if we except a certain quantity of tallow which would have to be imported from Australia for purposes of hardening perfumed soap. Any company starting to make soap on a large scale in Colombo would probably require help from the government in certain directions, particularly support against dumping from the outside, which experience shows can be made to strangle the life out of any new industry. In Australia the government gave, as is known, a boundry of so much per ton for five years to establish on a sound working footing iron works in New South Wales. In Australia, of course, the policy of preserving the life of local industries against unfair outside competition has full support in every State. Protectiou such as would be required in Ceylon for any new industries could probably best be given in the form of import duties, and the principle of this has long ago been accepted, notably in the case of the import duty on tea. I take up this subject to-day because I understand that at the present time enquiries are being made with the idea, if practical government assistance is forthcoming, of attempting to establish in Ceylon the new industry of soap manufacture. The commission pointed out that the most serious question affecting soap manufacture is the uncertain cost of cocoanut oil, and that soap manufacture here can hardly be expected to pay a reasonable profit unless the price of cocoanut oil is at medium or low level. This is a difficulty which of course would have to be borne in mind by those making the experiment. I understand

that it is not considered an insuperable one, however, and that given practical encouragement by the local government the necessary capital should be forthcoming to test the chances of success of this new Industry. Soap manufacture in Ceylon was one of the chief subjects taken up by the local industrial commission. The commission found that soap was being manufactured on a small scale and that capital was needed to develop the industry. Small factories started for manufacturing soap from cocoanut oil met with but moderate success, due largely to lack of experience on the port of the makers. No doubt in due course the report of the commission will receive careful attention in view of the importance attached by the Secretary of State for the Colonies to establishing industries in order to make the various parts of the Empire independent as far as possible of overseas manufactured articles. If it is found that soap manufacture on a fairly large scale in Ceylon can in course of time be profitably engaged in, then, apart from the large local consumption that would be created, there are considerable possibilities for export trade, notably to India, the F. M. S. and East Africa, among other countries. What the policy of the Ceylon Government will be with regard to facilitating the establishment of new industries remains to be seen. In India, as you are well aware, both in the Native States and in Imperial territory, the importance of helping on new industries has been recognized and very liberal assistance is given to pioneer companies. Mysore State, for instance, gives favourable customs and excise concessions, and in one case, that of the Mysore Pharmaceuticals, Ltd., exemption from taxation for 20 years.

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The following is a description of the stem bleeding disease of the Coconut palm caused by the fungus *Thielaviopsis ethaceticus went* as circulated by the Madras Agricultural Department:—The first indication that a tree is diseased is the exudation of a dark reddish-brown fluid from the cracks usually found on the stem. This fluid is reddish-brown at first and turns black as it dries on the bark. Behind the bleeding portion of the bark, the tissue is found to be decayed and has a yellowish-brown colour. In the early stages of attack the discolouration and decay of the tissue is localised. In the later stages when there are more than one bleeding patch seen on the surface, the decay is not localised but there is a general decay of the internal tissue. When the disease reaches that stage, the tree ceases to bear nuts, the crown diminishes to a few stunted leaves and finally the whole tree dies. On young trees the effect of the disease is at its worst, especially if the attack is at the base. In such cases, the external patches give no indication of the extent of the internal decay generally. The soft tissue inside rots and a cavity is formed in the central portion of the stem. There is an accumulation of some thin yellowish fluid which gushes out when the cavity is opened. If the decay happens to extend downwards, the tree becomes hollow without any external signs of decay. There is no treatment in such a case except to dig up the whole tree, carefully remove every bit of the roots and burn them on the spot. The progress of the disease seems to depend upon the age of the tree. If the infection is localised, removal of the diseased parts is the cheapest and most effective remedy. The diseased part of the coconut stem should be completely cut out and even a little more of the healthy tissue, say about one inch to make sure that all the diseased tissue has been removed. There is no difficulty in determining how much must be cut out since the decayed tissue which is yellowish brown can very well be distinguished from the surrounding healthy tissue which is flesh coloured. The best instrument to use is the ordinary one inch chisel and mallet. The decayed tissue cut out should be collected and burnt at once. The cut portion thus exposed should be tarred immediately after

cutting. As tar does not adhere well to a wet surface, the cut portion should be scorched or dried with a torch made up of a small bundle of dried coconut leaves. The tar is then applied hot, for this secures administration of the tar to some depth inside the tissues.

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A correspondent of *Near East* writes:—It appears that if a small percentage of dry chloride of lime is added to cement, or if a quantity of this is dissolved in the water with which it is to be mixed, the result is that the cement sets with extreme rapidity. This was made use of in the war, when concrete heavy gun foundations were made and were ready for actual use in less than three days. The question has been raised as to whether cement or concrete made in this way would be as durable as that which had been allowed to set at a slower rate, and quite recently the results of some tests commenced rather over a year ago have been made public. In view of the fact that quick-setting cements of the ordinary type are not all as permanent in character as could be wished, and with a knowledge that the engineering world would want some definite information to go on, these tests were instituted almost immediately after the chloride of lime theory was carried into practice. Laboratory samples of cement and concrete of various qualities were prepared and subjected to compression and other tests periodically. The results, which are for 4 per cent solution of calcium chloride used as mixing water, show that the effect is actually to increase the strength at all ages up to one year—the duration to which the experiments have extended to the present. There seems no reason to doubt the accuracy of the tests or their far-reaching nature, and consequently it would seem that contractors for road building, public works construction, and the like, can shorten the time of building considerably. Concrete road foundations, for example, would be ready for the laying of the blocks or the carpet within a comparatively few hours, and not only would the work be expedited, but the inconvenience to the public and to traffic users generally would be lessened. At the same time it would be well were the experiments continued, and I should like to see extended and exhaustive tests made by some representative body. My reason is that I have always understood that chloride of lime had a remarkably strong affinity for water; was markedly hygroscopic in character, and unless some chemical change takes place when it is mixed with the cement it would seem probable that its use would tend to make the concrete damp. I have an idea that damp concrete would tend to disintegrate. I may be wrong, but, at any rate, I should like to know that further research work was being undertaken in this connection.

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In view of the increasing price of natural oil and the growing fears of a coming shortage, it is not to be wondered at that engineers have been devoting time and attention for some time past to the question of finding a substitute which shall be obtainable in adequate quantities, be comparatively low in price, and which shall have approximately the same heating value. The first really promising result of their work has been the production of the new liquid fuel, which has been given the name of Colloil. Scientific research has demonstrated the possibility of resolving most substances to a colloidal state, in which the particles are so finely divided that they are formless and to some extent resemble a fairly stiff liquid glue. It has been found that coal washings which have hitherto been dumped at the pit-head, the refuse from saw pits and paper mills, and the sludge from commercial coal cleaners can be brought to this condition and intimately mixed with oil residues and fuel oils. In this connection the oil obtained from low-grade coals, peat, and lignite by the low temperature process of distillation is particularly

suitable. This mixture may be burned in the same way as any other liquid fuel, and can be used with most existing types of burners, and thus, in addition to become a competitor with and a substitute for oil, it also competes with the comparatively newly adopted system of burning powdered coal driven by air or steam pressure through a jet into the furnace. It would seem that this new method would provide a means whereby good use could be made of the quantities of anthracite dust which have accumulated, and which it is difficult to use in any other known way. The percentage of oil and dust in the new fuel are about equal, and it is said that the cost of production should not exceed the price at present paid for coal which would have, weight for weight, a far lower calorific value. The new fuel, so far as the latter point is concerned, and when anthracite dust is used, would compare more than favourably with oil, and should be obtainable at about half the price of fuel oil as soon as working is commenced on a commercial scale. The essential claim for the new fuel, however, is that fuel dusts, which are difficult or impossible to use in any other way, can be utilized to advantage and satisfactorily burned in an ordinary furnace.

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A Government of Bombay notification issued by the Revenue Department (Development) gives the following information regarding the issue of a 6½ per cent Income Tax Free Loan for development and housing purposes: "With the sanction of the Secretary of State for India in Council, the Government of Bombay have resolved to issue a loan for the purpose of financing the housing and other schemes of development to be undertaken by Government in and around Bombay and by the Bombay Municipal Corporation, by the City Improvement Trust, Bombay, and by the Bombay Port Trust. The loan will be secured on the revenues of the Government of Bombay, to be allocated under Section 30 (1) (*a*) of the Government of India Act, 1919. Subscriptions will be received from September 8 to October 30 inclusive. The Government of Bombay undertake to repay the loan at par on November 1, 1935. The issue price will be Rs.100 for every Rs. 100 of loan applied for. Interest will be payable half-yearly at the rate of 6½ per cent per annum on May 1, and November 1, at the head office, or any branch of the Bank of Bombay. Advance interest from the date of purchase up to October 31, 1920, will be paid at the time of issue of the temporary receipt. Interest on the loan will be paid throughout its currency free from income-tax, liability for which will be discharged by the Government of Bombay at the rate for the time being in force; but such interest well be taken into account in determining the rate at which the tax will be levied on other incomes and will be liable to super tax. A sum equal to 1 per cent of the aggregate amount of the loan will be set aside annually to form a fund to be used for the purchase of loan at or below par and cancellation thereof. The loan will be issued in the form of promissory notes in denominations of Rs. 100, Rs. 500, Rs. 1,000, Rs. 5,000, Rs. 13,000 Rs. 25,000 and Rs. 1,00,000.

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In engineering circles generally the memorandum isued by the Fuel Research Board, which is considering the whole question of fuel for use in connection with internal combustion engines, under the auspices of the Department of Scientific and Industrial Research, has been received with some degree of amusement. It would seem as though the committee had carefully avoided going into any but the most orthodox and old-fashioned suggestions for producing power alcohol; had judged these wanting, and then had immediately rushed out a report to say that in their opinion nothing could be done in the matter. One or two writers on the subject have been content to take the findings of the board as final, and recently one definitely stated that power alcohol was an

imaginary fuel . . . neither practical nor possible. As a matter of fact, it is a very practical and possible fuel that has been used for internal combustion work in certain other countries for many years, either alone or in combination with benzol, petrol, or paraffin. It is argued that power alcohol, made from barley, would cost for raw material alone about 7s. per gallon, If potatoes were used the cost would be about 8s. 6d., while in the case of mangolds the cost would be 3s. Obviously, very considerable acreages would be required to grow the crops, and for a production of 250,000,000 gallons (the estimated consumption of petrol in the United Kingdom this year) it would be necessary to put 5,593,293 acres under barley, 211,864 acres under potatoes, and 1,282,513 acres under mangolds. This is all very much beside the point. No engineer would propose to grow barley or mangolds for distillation. On the other hand, he would produce his alcohol from other starch-containing vegetation; from the waste lye of paper and pulp mills; from the Indian bassia flowers; from calcium carbide; and from a host of other readily available and cheap materials.

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The future of the sewing machine trade deserves the serious consideration of every one in the trade in this country, particularly of those interested in sewing machines and supplies. It is a pity that up to now India has been entirely dependent upon foreign countries for the supply of sewing machines and parts. During the war in spite of a total restriction of imports of German sewing machines 251,443 machines were imported into India from the United States, which were sold at exorbitant prices with a profit amounting to almost 400—500 per cent. There is absolutely no reason why India should not take full advantage of this opportunity and not introduce and advance its own industry. The losses during the war, the scarcity of machines and the expansion of trade, are facts that combine to uphold the present prices for some time to come. The shortage of sewing machines in relation to this country's demands and requirements has been very severely felt by sewing machine dealers and buyers alike in India, and is likely to continue unless sewing machines are manufactured in India itself. In view of the growing consumption of sewing machines in the country and in spite of the immense quantities of imports from different parts of the world, even if a large number of factories are started they will hardly be able to turn out sufficient quantities to cope with the demand. Consequently a sewing machine factory is bound to achieve success and afford to capitalists the safest and best investment. Since the prices of sewing machines have gone up considerably and they are still not available, it is the most opportune moment for India to introduce this industry; and a great inducement for floating a company is that a heavy duty on the import of sewing machines is expected to be levied, which naturally will place the company in a position to compete favourably with machines manufactured in any other part of the world.

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In view of the present scarcity in the supply of cotton, the attempts now being made to establish cotton growing on a large scale in Mesopotamia are of particular interest. Cotton has been grown in Mesopotamia from very ancient times and is still cultivated in small quantities by the Arabs in conjunction with food crops along the banks of both the Tigris and Euphrates. The fibre is used locally for spinning and as a stuffing material for pillows and mattresses. The country possesses a soil and climate favourable to the production of large yields of excellent cotton and in course of time it should add materially to the world's supply. Since 1917 experiments have been conducted by an expert from the Indian Agricultural Service with a view to discovering the most suitable kinds to grow, and the results of the work done in this connection and the pros-

pects of establishing a cotton growing industry are fully dealt with in the current number of the *Bulletin of the Imperial Institute.* So far, American types of cotton seem to be the most suitable for cultivation in Mesopotamia. The members of a deputation of the British Cotton Growing Association, which visited the country towards the end of last year, were very favourably impressed with its possibilities for cotton production. The acreage which will eventually be planted with cotton in Mesopotamia will depend on the quantity of labour available and the area on which a perennial supply of water can be guaranteed. It seems likely that a total of 150,000 to 200,000 acres could be cultivated annually by the existing population if the necessary facilities, in regard to agricultural machinery, transport, etc., were provided. At a low estimate this area should produce from 15 to 20 million pounds of cotton yearly.

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The Acting Commercial Secretary to H. M. Legation at Berne says:—One of the chief industries in Switzerland is the manufacture of silk goods, of which the centre is Zurich. This silk industry dates back to the thirteenth and fourteenth centuries. During the last 50 years the district of Zurich has concentrated its energies on silk textiles, whereas Basle has made a speciality of silk ribbons and floss silk. The following table gives the extent of the export value of the Zurich textile industry and the Basle silk ribbon and floss silk industries for the years 1907 and 1913-19:—

Export value in millions of franks.

		Zurich fabrics Silk	Basle ribbons Silk	Basle Silk Floss
1917	...	117·9	45·7	27·2
1913	...	112·5	42·0	28·3
1915	...	128·4	60·0	29·0
1916	...	167·7	73·1	61·0
1917	...	144·0	54·8	52·7
1918	...	110·5	52·9	38·7
1919	...	427·0	104·0	55·0

To the above figures may be added ten million francs' worth of silk taminy from Thal (St. Gall). Switzerland also possesses a large factory for artificial silk in Emmenbrucke, near Lucerne. Basle is the chief centre for silk ribbon weaving and competes successfully with France, Germany, and the United States of America. In 1916 the value of silk ribbon exports reached a total of 73 million francs, and in 1919 the value of such exports exceeded 100,000,000 francs.

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The passing of the Imperial Bank Bill took up the entire afternoon session of the Imperial Legislative Council on the 8th Sept. last. There were twenty amendments to the Bill, twelve of which were in charge of Mr. Hailey. Mr. Muddiman piloted three, Mr. Tata moved two, and Mr. Nathmal moving the rest. Mr. Hailey, in moving that the report of the Select Committee on the Imperial Bank Bill be taken into consideration, said the Bill was discussed at length at Delhi in March last, and the report of the Select Committee was unanimous. Several changes had been made in the Bill, and he did not propose to touch on its principles. The amendments were then taken into consideration, the official ones being accepted, and of the non-official amendments four were withdrawn, two were accepted, and one was rejected. Mr. Hailey finally moved that the Bill as amended be passed. He said the Council had come to the end of a long list of events. The Bill was intended to afford improved banking facilities. The three Presidency Banks had a long and honourable career. He disproved the fear that the Imperial Bank would be a dangerous competitor to private banks. It would, on the contrary, enhance the economic and industrial progress of the country. From the ashes of the Presidency Banks would now arise a bank with a wider scope, called the National Bank of India. The Bill was finally passed amidst cheers.

Before the war, says a correspondent of the *Times of India*, we used to import lampware from Germany to the extent of 28 per cent, from Austria-Hungary to the extent of 28 per cent, from Belgium 11 per cent, whereas England sent out only 7 per cent. In 1917-18 even that percentage dwindled to 6, while Japan's exports of glass rose to 90 per cent. Even in the matter of tableware the same decline is to be noted. England exported 33 per cent of sundry glassware to India before the war, which has now descended to 20 per cent, while Japan has rapidly climbed up from 19 to 70 per cent. During the same period the opportunities extended to India of self-improvement and advancement were fully utilised, a point on which the Indian Munitions Board comments in its latest report. The report also says that India is still unable to turn out useful tableware, though nearly fifteen glass manufactories are now producing other glass manufactures. Glass tubes, flasks and bangles have absorbed the attention of the manufacturers.

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The Madras Publicity Bureau says:—The Government have directed the transfer of the School of Arts, Madras, to the Department of Industries. The Director of Industries has been requested to submit proposals, in consultation with Mr. Hadaway for the re-organization of the school. Mr. Hadaway will be in future the Director's expert adviser in respect of artistic Industries throughout the Presidency. The attention of the Director of Industries has been drawn to the Secretary of State's Despatch No. 9 Public (Educational), dated 6th February 1896, printed in G. H. 341 Educational dated 8th June 1896, laying down the principle that the function of the school should be the encouragement of Indian Art so as to develop the special artistic tendencies of the people with whom it deals and enrich those industries in the products of which beauty of form or colour or both may be superadded to the primary purpose of utility; and he is requested to ensure that this principle is kept in view.

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It is stated that there has been finally perfected in Honolulu a machine which will separate the fibre from the pulp of banana stems. As is well known, after the fruit is cut, the stem of the banana plant either dies to itself, or is cut away. For lack of a machine capable of dealing with these stems the valuable fibre contained in them has hitherto been wasted. The ordinary banana acreage is given as from 400 to 600 plants. From each of these it is expected that 2 lb. of fibre can be extracted by the newly invented machine. Besides extraction of the fibre the same machine separates the pulp which will make an admirable ingredient in paper stock. A banana plant consists of about 93 per cent water, 3 per cent fibre and 4 per cent pulp. There appear to be great possibilities before this industry, both in the production of fibre and in the utilization of the pulp in paper manufacture, says the *Wealth of India*. (Vol. IX, No. 1.)

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It appears from the official report of the proceedings of the sixteenth session of the Travancore Popular Assembly, just issued to the press, that schemes for the establishment of a pencil factory at Alwaye and a match factory at Nagercoil at private expense have been sanctioned. A pencil expert, trained at the expense of the State, has been appointed to supervise the match factory. An investigation into the possibilities of the paper pulp industry has been taken up by the Department of Industries. Arrangements have also been made for the organization of industrial conferences and exhibitions and for the formation of industrial associations in important centres. Efforts are also being made to establish an Industrial Museum and Bureau in Trevandrum. These indications of industrial activity are refreshing.

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The *Manchester Guardian Commercial* publishes particulars from its Basel correspondent of one of the biggest deals ever put through in the history of the dye industry. It involves an account exceeding 25,000,000 francs (£1,000,000) and refers to the acquisition of a factory in America by the Swiss colour manufacturers. The Swiss dyestuff producers are co-operating under an agreement made during the war by which they pool their profits. This colour ring is composed of the Society of Chemical Industry, the Sandoz Chemical Works, and the Geigy Chemical Works, all of Basel. They have recently purchased the establishment of Ault and Wiborg, a factory of dye products in Cincinnati, Ohio.

GLEANINGS.

order to hasten reconstruction, Bulga- law provides that all males give to the ɜ, for a certain period during the year, : service in whatever capacity it may be red. Road construction is now being ertaken, and by this means roads which in a state of disrepair will at once be put ɪrder.

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Trinidad petrol is beng sold in some of the ghbouring colonies at a much smaller ure than in the colony where it is produced. section of the Trinidad Press is urging the overnment to issue an order prohibiting the portation of the article until a prescribed ıantity is placed on the local market at a ked rate.

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In order to develop the sugar industry in ne eastern section of Jamaica, the Govern- nent has been asked to arrange with large property owners to assist in formulating a small cane farmers' scheme whereby the peasantry would be able to procure lands, in from five to twenty acre lots for a period of 10 or 20 years at moderate rental.

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Returned soldiers now on the employment registers of the Australian Repatriation Department number 7,556 or only 3 per cent of the total number of men discharged from the Australian Imperial Forces to date. On March 24 there were over 15,000 seeking employment, with 14,000 still to be demobilized.

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A prize of $25,000 (about £6,000) has been offered by Mr. Raymond Orteig, of New York, for the first airman to cross the Atlantic in an aeroplane or seaplane, from Paris or the French coast to New York or from New York to Paris or the French coast ... as from May 28, 1919.

In the House of Representatives at Melbourne, last month, Mr. Hughes, the Prime Minister, stated that a record area was under wheat in Australia. The prospects were exceedingly favourable, he added, and there was every possibility of a most satisfactory yield.

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The New South Wales Government has completed the construction of the storage portion of a terminal elevator of 5,000,000 bushels capacity at Sydney, and is now erecting the remaining portion, which it hopes to complete in 18 months.

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Canada's wheat crop for 1920 is estimated by the Department of Agriculture at 262,338,000 bushels, as compared with 193,260,000 for last year; the oat crop is estimated to yield 496,906,000 bushels, as against 394,387,000 last year.

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While the Jewish people will be permitted to develop and reap the harvest from land purchased in Palestine by the Jewish National Fund, and also be privileged to leave it to their children, they can never sell it.

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It has been decided by the Canadian Government that the present Wheat Board is in function in so far as the wheat crop of 1920 is concerned. In marketting the crop people must revert to the methods of normal prewar times.

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Rio de Janeiro business circles are demanding from the Brazil Government permission to export 70,000 bags of sugar. The Pernambuco sugar harvest will commence very shortly and is expected to be an abundant one.

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According to the Report on the Administration of Indian Companies Act, in Bengal, recently issued, 306 Companies under Indian

mangement were registered during 1919-1920 as compared with 71 in the 1918-1919.

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A start is expected to be made with the State University at Cairo next academic year. The report of the Committee is now ready, and the Cabinet will shortly discuss the project.

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Looted treasure was known to have got into the hands of undesirable persons, and the Council of the Association of British Dealers decided to take joint action in this illicit traffic.

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After three and a half year, the Government control of wool in Australia has been given up, and business has been resumed in open market. Prices are about 50 per cent above pre-war rates.

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There is the same shortage of housing accommodation in Algeria as in other parts of the world. The increased cost of building material and high cost of labour has also checked the construction of hotels.

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An enormous increase of business at Antwerp will result from the new canal connecting the Rhine and the Schelde, as when completed, it will shorten the waterway from the Upper Rhine to the sea.

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At a recent meeting of 527 West, Australian farmers, it was unanimously decided to subscribe £250,000 towards the £1,000,000 required for the establishment of wheat elevators.

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A recent German estimate prepared by experts states that the European sowing of beet will show an increase of 13·12 per cent over last year. Russian Ukrain is excluded from this forecast.

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United States Customs officials have intercepted a packet from Russia to "Comrade Martens," containing more than 100 diamonds which are believed to be part of the famous Russian Crown jewels.

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The Government of India have been offering for sale in the United States large stocks of textiles, consisting of flannel, khaki cloth, mosquito netting, towel cloth, woollen cloth and calico.

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According to a statement in the annual report of the Malaya Planters' Association should the present demand for motor tires be maintained by 1934 there will not be enough rubber to cope with it.

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As a result of the distress of agriculturists due to the effects of the drought which has recently broken a total of £776,200 had been distributed in relief by the New South Wales Government.

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The high price of sugar and the Queensland cane sugar shortage are encourging beet sugar growing attempts in Western Australia. Seeds have been applied for from England and the United States.

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In connection with a proposal to instal a wireless telephone system in Manitoba, successful experiments from Winnipeg to Portage La Prairie (60 miles distance) have recently been concluded.

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For the purposes of stimulating international trade relations Commercial Attaches have been added to the Brazilian diplomatic *personnel* in London, Paris, Washington, Buenos Aires, Santiago, and Berlin.

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According to the Japanese Shipping Controller, last year the tonnage of merchant vessels built in Japan amounted to about 700,000, this being about ten times the prewar output.

The future exportable surplus for Greater Roumania is estimated at 5,000,000 tons of cereals, in addition to 500,000 tons St. Petersburg standards of timber and 1,000,000 tons of petroleum products.

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Foreign emigrant ships, sailing from Spanish ports, will now be subject to a progressive tax, which starts at £413 for 2,000 emigrants.

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Sweden is proposing to erect one of the largest wireless stations in the world, able to be in constant communication with North America.

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By 36 votes to 19 the Ausralian House of Representatives passed the second reading of the Industrial Bill establishing tribunals to deal with labour disputes.

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It has been decided to consider a scheme to form a National Opera Company in Sydney, New South Wales, and to seek Government financial assistance.

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Food production in Portugal is reaching a crisis, and a former Minister of Agriculture predicts famine unless the home production of wheat be considerably increased.

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Industrial Councils are to be formed in Australia, to consist of a chairman and six members, three representing employers and three employees.

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An aeroplane race from New York to San Francisco for the Pulitzer trophy, which is to be known as the National Aeroplane Race, will be held in October or November.

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Sir Joseph Cook stated, in the House of Representatives at Melbourne recently that the Commonwealth's war debt amounted to £313,000,000.

Holland is making active preparations for the celebration of the Tercentenary of the Pilgrim Fathers, which will take place between August 29 and September 2.

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The *Moniteur* announces that owing to various denunciations of the 1902 International Sugar Convention, the International Sugar Union ceased to exist on September 1.

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Under Government auspices the United States' aniline dye industry, which was non-existent five years ago, has now £9,000,000 invested in it.

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The Pacific Mail Steamship Company recently concluded an arrangement whereby it will erect a private pier at Manila four times as large as any now existing at that port.

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Direct communication betweeu Tangir and Teutuan has been established over a newly-constructed tract by a daily road service of four-seater motor-cars.

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Seven bird sanctuaries have been established in Alberta, with the idea of protecting the chief breeding areas of wild birds and to insure the various species against extinction.

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Plans for the expenditure of $40,000,000 (£8,000,000 pre-war on highways in Quebec and Ontario have been approved by the Canadian Government.

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Antwerp is now the starting point of 89 navigation companies, many of the lines going to all parts of the World. It is also the calling point of 40 foreign lines.

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Sugar export, which first took place from Costa Rica in 1914, amounted to 157,173 kilos, valued at 41,324 colonies. In 1919 the exports totalled 2,043,815 kilos valued at 529,428 colonies.

The Phillippines Legislative has approved of the issue of $6,000,000 in bonds to provide funds for the improvement of the harbour of Manila.

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Since May about 100 families per week have been leaving Winnipeg, "back to the land," on account of the shortage of houses in Western Canada.

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A Convention between France and Poland for the transport of mails by air has been signed, and the route will follow the line Paris-Strassbourg-Prague-Warsaw.

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Coal shafts are being sunk at Lampman, Saskatchewan, by the Farmer's Coalmining Company, and it is expected that the mines, when completed, will yield 1,000 tons a day.

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Increases in civil servants' salaries involving a total expenditure of £387,000 have been proposed by the Government of Victoria (Australia).

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Flamingoes, having been greatly reduced in numbers by the depredations of fishermen, are to be protected by the Government of the Bahama Islands.

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Frau Margarete Bruehl, the owner of a grain firm, is the first woman to be admitted to the Berlin Bourse.

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There are six factories in Trinidad engaged in the manufacture of cocoanut oil, the output of which is about 140,000 gallons a year.

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The total number of strikes in Holland last year amounted to 598, against 305 in 1918.

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As a rubber producing country Sumatra bids fair to be the most profitable field in the world.

Owing to the increased cost of printing, the Berlin Academy of Sciences is no longer able to publish its works.

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Four new banks, having a joint capital of 7,000,000 yen, have begun business operations at new Wijo and Seoul, in Korea.

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The appointment has been sanctioned of a Trade Commissioner to represent the interests of Indian trade in East Africa.

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Trains running with oil fuel are now making regular journeys from Nairobi to Athi River, in the Kenya Colony.

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Instructions have been sent to the Chilean Minister at Berlin to engage German labour to work in the Chilean mines.

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This season the area under crop in Australia is 11½ million acres, an increase of 3½ million acres over last year.

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Java has this year 156,971 hectares under cane cultivation. Last year the total was 137,031 hectares.

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Cargoes of coal from the United States are being delivered at Algerian ports.

ECONOMIC NOTES.

INDUSTRIES AND COMMERCE.

The Java Sugar Industry.

Java is the third largest sugar-producing country in the world, ranking next to Cuba and British India. As the last consumes practically all that it produces, Java ranks next to Cuba in sugar exports, actual production being about half of the Cuban output, and approximately three times the production of the Hawaiian Islands. Compared with the Hawaiian industry, where, it is understard, there are about fifty sugar centrals, Java has at present 186 producing mills, says the *Journal of the Society of Arts* :—

It appears from a report by the United States Consul at Soerabaya that, on account of the density of population in Java, which is estimated now to be more than 30,000,000, the Government does not permit of large concessions of land, and will allow the use of any given tract of land for sugar production for only one year out of three, requiring that rice be planted for the other two years. This necessitates a rotation of crops in three-year periods, and continually reserves two-thirds of the available sugar land for the production of rice. This has been found to be a very wise provision, since, even under the present system, the consumption of rice is greater than the production in Java in normal years, so that the country is somewhat dependent on the near-by rice-producing countries for imports of the staple food supply. During last year there was, in fact, considerable discussion looking toward the further restriction by Government of sugar cultivation, in order that the local rice production might be increased. This proposal was eventually abandoned, however, in view of the importance and value of the sugar crop at the present time of great world demand and consequent high prices.

The sugar-mills are for the most part large modern plants, although some of the labour-saving devices in common use in many other countries are not used owing to cheap and plentiful labour. There is now, however, a growing interest in labour-saving appliances and machinery, due to the increased cost of labour and a certain amount of labour trouble which seems to be prevalent to-day in Java as well as other parts of the world. Java sugar-growers are now, for the first time, coming to a realisation of their rather precarious situation in depending so completely on unskilled labour.

It would appear that the time for the introduction of labour-saving machinery is rapidly approaching, and careful and systematic efforts by manufacturers in this direction should bring results during the next few years. Most of the estates are supplied with light railways, operated with small, light wagons, but many still rely largely on bullock-carts for bringing the cane to the mills and native labour in handling it. Many estates use small wagons on the light railways, either pushed by hand or drawn by bullocks, while only a few have locomotive equipment.

The transportation of cane is especially difficult in Java, because of the fact, above mentioned, that planted areas are in small plats interspersed with plots of rice paddy, so that a plantation of 2,000 acres of cane is compelled to extend its transportation system over territory of three or four times that amount of land. Figuratively speaking, a plantation of four square miles of cane, where the longest haul would be about a mile if the mill were placed in the centre of a compact tract of that size, would require a long haul of more than two miles, if only a third or fourth of the land is in cane. Actually the difference is, in many cases, considerably greater than in the above hypothetical case, since the plats are not arranged with mathematical precision. A certain plantation, for example, of approximately 4,000 acres under cultivation, must haul the cane about eight miles from some of its more distant fields. As the plats are changed from year to year, much of the light railway must be portable,

MADRAS INDUSTRIAL SCHOLARSHIPS.

The following draft notification has been issued by the Madras Government :—

Industrial scholarships will in future be awarded by the Director of Industries to pupils learning a trade or profession in recognized industrial schools or to selected apprentices (boys or girls) serving properly arranged apprenticeships for a specified term of training in worksbops or mills where provision is made for the apprentices receiving class instruction in working hours for not less than four hours per week in subjects calculated to improve their value as artisans or operatives on completion of their training. The aim of these scholarships is to encourage deserving apprentices and pupils to complete their

whole apprenticeship or period of training at one institution or workshop and so to some extent check the present tendency of apprentices to move from workshop to workshop in search of a few annas increase in wages to the detriment of their training and the annoyance of their employers.

2. For the present, sixty scholarships will be awarded per annum tenable in approved schools or workshops or mills for a period of five years or such shorter term of apprenticeship as may be usual in the particular trade or occupation.

The scholarships will be of the value of—

Rs. 1-8	per month during the	first	year of training.
,, 2	,,	second	,,
,, 3	,,	third	,,
,, 5	,,	fourth	,,
,, 7-8	,,	fifth	,,

A bonus equivalent to two months overage scholarship will be granted for each year of training to such of the apprentices as satisfactorily complete the whole period of training agreed on at the commencement of the scholarship.

The conditions of award will be as follows :—

(1) All scholarship-holders shall be on probation for six months, after which the scholarship will be confirmed or withdrawn after consideration of a report from the employer or teacher regarding the scholar's work. Scholarships will ordinarily be granted to members of the artisan castes or to others whose families are already in the trade.

(2) No scholorship will be granted to candidates who are over seventeen years of age at the commencement of their apprenticeships, but in the case of Muhammedan candidates, the age limit may be raised by two years.

(3) The general educational attainments of candidates should be such as would enable them to profit by the training provided. Ordinarily a standard V pass in the primary grade will be regarded as the absolute minimum, but the nature of the trade to be followed, the pecuniary circumstances of the candidate, and his general fitness for the work will be taken into account in deciding whether a candidate is qualified for the scholarship.

(4) The candidate and his guardians must enter into an agreement with the employer that he will faithfully fulfil the conditions of apprenticeship, and unless prevented by sickness or other circumstances beyond his control, serve the full term of apprenticeship that may be agreed on.

GENERAL REGULATIONS.

3. Applications for scholarships should be submitted by the head of the institution in which a candidate is studying or intends to study or by the candidate's employer or his manager on or before the 15th April in each year. Applications should be accompanied by a 'clearance' certificate from the school last attended and by such other particulars as are likely to assist the Director in coming to a decision, and should be made on forms which may be obtained from his office.

4. The names of selected candidates will be notified by the Director of Industries in the *Fort St. George Gazette*. Each scholarship will come into force on the 1st July.

5. Any scholarship withdrawn during the period for which it is tenable may be awarded with the consent of the Director of Industries for the remaining period to any eligible applicant.

6. Heads of institutions and employers may grant leave for a period not exceeding one month to scholars who are absent in consequence of severe sickness; but if the leave exceeds this period no scholarship will be granted for the period exceeding one month. Casual leave may be granted for good and sufficient reasons for a period not exceeding fifteen days in the year. If a scholarship-holder absents himself without good reason on the reopening day after the vacation or holidays, the scholarships for the vacation or holidays is liable to be withheld by the Director of Industries.

7. No person receiving a scholarship under this notification will be permitted to hold another scholarship, provided wholly or partially by Government, without the special sanction of the Director o Industries.

8. All scholarships are liable to forfeiture for idleness, misconduct, irregularity in attendance or failure to make due progress or to secure annual promotion.

9. A scholarship held in any class or year of apprenticeship shall run from the beginning of the month in which the holder joins the class and shall not be drawn after he ceases to attend the class or leaves the workshop. The scholarships are payable monthly.

10. In all cases where poverty has been made a condition of award, applications will be summarily rejected unless there is evidence to show that but for

a scholarship, the applicant will not be able to continue his studies.

11. In addition to any register maintained under rule 60 of the Madras Educational Rules an acquittance roll containing the following information shall be maintained by the heads of the institutions or employers concerned and should be produced at the time of any departmental inspection of the institution, or workshop or mill :—

(1) Number; (2) name of scholarship-holder; (3) standard of scholarship; (4) monthly value of the scholarship; (5) period tenable; (6) number and date of the order in which the scholarship was sanctioned; (7) month for which the scholarship bill was drawn; (8) date of the encashment of the bill; (9) date of disbursement of the scholarship money and amount; (10) signature of the scholarship-holder; and (11) remarks.

12. Government trust that employers of labour will co-operate with Government in this scheme to the extent of conducting recognized classes in their works during working hours or allow their apprentices time off duty to attend classes in the Madras Trades School or any other place where suitable training is provided.

13. Works schools and classes will be eligible for recognition and for a Government grant provided they are conducted to the satisfaction of the Director of Industries, irrespective of the number of scholarship-holders in attendance.

FINANCE.

World's Monetary Situation.

A very able survey of the financial and economic problems with which belligerent and neutral nations alike find themselves confronted in varying degrees as the result of conditions arising out of the war is given by Professor Cassel in his "Memorandum on the World's Monetary Problems." Its outsatnd ing merit is, the *Near East* says, its absolute directness. Professor Cassel is nothing if not concise, and in the plainest of terms he sets forth the problem that the nations have to solve for their well being, disposing on the way of the numerous fallacies regarding high prices, the exchanges and other matters that have been allowed to interfere with clear thinking on this vital subject, and then explains the path that it seems to him must be pursued if the disease is to the remedied. He does not cover new ground in his suggestions; the expedients he advises are those which have obtained general acceptance among economists and financiers, but those who expected novelty can scarcely fail to be convinced by his closely reasoned presentation of the case.

High or Low Exchanges Immaterial.

What he says in regard to trade and the exchanges is of special interest. The restrictions on trade that have been introduced be various countries come in for strong condemnation. The prohibition of exports, the licensing or rationing of exports, measures to keep up higher prices for foreigners than for the home market, are examples of methods, it is pointed out, which all work in the direction of a corresponding depression of the international value of the currency of the country applying them. There are, of course, exceptions to the rule, as for example the restrictions of the import of luxuries which obviously must have an enhancing effect on the international value of a currency.

It needs no emphasis that any deviation from the purchasing power parity of the exchange between two countries must adversely affect trade, but Professor Cassel lays stress on the point that as soon as this parity has been established it is immaterial whether the level is high or low. "Thus, the export trade of a country is not hampered by low quotations of the foreign exchanges as long as these quotations only correspond to a high level of prices in foreign countries or a low level at home; nor is it especially stimulated by high quotations of the foreign exchanges as long as these only correspond to the relative purchasing power of the monetory standards quoted. Likewise, low prices on foreign currencies do not mean an encouragement of imports from them or a handicap for the home producer, provided these exchanges are a true expression for the purchasing power of the foreign money; on the same condition, high prices of foreign currencies do not in any way hamper the import from them. In fact, the terms 'high,' or 'low' exchanges have no sense in themselves; if they are to be used they must obviously refer to the normal rates of exchange *i.e.*, to the purchasing power parities. But when used, as is generally the case, in reference to old parities which have lost all real significance, they are in the highest degree misleading."

NEW PARITIES.

The temptation to regard the exchanges from the light of the pre-war parities is inevitable and natural, but it is, Professor Cassel points out a grave mistake as the result is that people often represent an exchange as being against a country when the opposite is the case, and *vice-versa*. The world, he says, will never come back to the pre-war parities, and sooner or later people will have to accustom themselves to look upon the new purchasing power parities which will in due course be evolved as the true parities. In commercial circles here, this view has long obtained, but it is not so abroad, where the parity to sterling, given that sterling itself is at par, is still looked upon not as an ideal, but as a readily realisable project. Obviously, the maintenance of this belief means the hampering of trade until it is understood that the parity to be looked forward to is the purchasing power parity, and not a parity which represents conditions that cannot be reproduced.

The exchanges are based on a country's internal financial position, and an improvement of a country's exchange can only be brought about by enhancing the internal value of its monetary unit; and to do that, Professor Cassel points out, a country must succeed in reducing its inflation. That is the way to the world's financial reconstruction, whether one considers the problem of the exchanges or any other aspect of the complicated situation. As Professor Cassel expresses it, "As long as inflation is allowed to go on, deteriorating still further the monetary standards, there is no hope for any work of reconstruction." Eighteen months have passed since the Armistice, but there has been so far no serious attempt to tackle the problem of inflation; on the contrary, by one means or another (perhaps unconsciously in the case of subsidies, etc.), the opposite policy has been pursued, and the problem that has now to be grappled with is far more serious than it was on November 11, 1918.

EVILS OF INFLATION.

The result of the continuance of inflation is that as the supply of available money can be arbitrarily increased, opportunities for its utilisation automatically increase, labour wants more wages, prices are increased, and the vicious circle is established. "In one word," says Professor Cassel, "we shall have all the factors moving which people generally look upon as the real causes of a general rise of prices. The deficiency of the popular explanations is plain enough: these factors are *always* at work as tendencies; but they are, normally, kept within due limits by a definite scarcity of money, imposing the hard necessity of restriction." The restoration of the scarcity of money is the only way, he points out, of combating the enhancement of prices and the rising cost of living.

The stabilisation of the monetary standard depends on a limitation of the supply of money, and can be achieved only by the imposition of severe restrictions alike on the business community and on the demands of Governments for money. These demands have obviously been the chief factor in the inflation that has taken place during the war, and has been going on to a greater or lesser degree since the Armistice. Professor Cassel urges that as soon as possible there must be a complete end to attempt to reduce the prices of commodities or services by means of subsidies. The withdrawal of the subsidies will obviously mean an increase in prices, the consumer's purchasing capacity will be decreased, and the tendency will be to the depression of other prices. In other words, the movement towards the restabilisation of internal values will have set in, and as soon as that process has been successfully accomplished the stabilisation of the exchanges will also have been achieved.

While inflation must be ended as the first step in financial and economic reconstruction, Professor Cassel does not view the idea of deflation with favour except in certain cases. A deflation within definite limits is possible, he points out, in the case of this country, where a reduction in the general level of prices by about 20 per cent would probably be sufficient to establish the parity between the paper pound sterling and the gold sovereign, and therefore also to bring up the dollar exchange value of the pound sterling to its old parity. But it is emphasised that in other cases this aim is undesirable as the effect on industry would be seriously out of proportion to what would be achieved.

APICULTURE.

Bee-keeping.

We take the following interesting article by Mr. Lakhan from the proceedings of the *Agricultural Society of Trinidad and Tobacco* (Vol. XX. Part 2.)

Bee-keeping or Apiculture is a most interesting and paying industry, it has proved quite a success in some of the other West Indian Islands, *viz*:—Jemaica, Cuba, Grenada and Hayti. In Trinidad the industry is just in its infancy but if it is taken up in the right way, according to *Modern Methods* (which I shall explain and show when I come to demonstrate) and considering how well we are situated the island could be made to yield its share of

honey and bees-wax. The peasantry and others interested must be taught the right way; those persons who have travelled about the country districts must have seen kerosene boxes and even barrels in which bees have been dumped. The better part of these are exposed to the bee-moth which is a natural enemy of the bees, which would easily take hold of the situation, destroy and be a source of annoyance to other bee-keepers who are running on modern lines, so from the very start I would urge that bee-keeping be taken up according to *Modern Methods*.

THE TERM BEES.

There are different races of bees, *viz*:—Caucasians, Cyprians, Italians, Holy Land Bees. The native bees of Trinidad are Black Bees, etc. The one I would like to tell you about this afternoon is known as "Italians." They have proved without doubt the best all round. The home of these bees, as the name suggests, would be Italy; between the years 1855-1858, some were taken over to America and to other parts of the world for honey-making, gathering, prolificness of the queens—being able to fight against diseases and enemies they are unsurpassed; they are also known under different heads as:—Three Banded, 5 banded, leather coloured, Goldens, etc.

In Trinidad we have the Italians, and in many cases we have crosses known as Hybrids—some of the latter are good honey gatherers, but not easily managed, so all up-to-date bee-keepers try and rear as pure a stock as possible.

CLIMATE.

Before I come to the hives and its inmates I must touch on the climate and flora of Trinidad. Climate plays a very important part in bee keeping; if we were to compare the climate of Italy and the United States with that of Trinidad we would find that the two countries above referred to are situated in the North Temperate Zone and enjoy about the same climate. Apiculture has proved quite a success in these two countries and especially so in the United States. The wintering of the bees, that is putting them up in cellars during the season, forms a most important part of the work in these Temperate Climes—the bees have to be fed, getting them ready for the Spring the queens would stop laying, and work is more or less at a standstill; but it is not so in Trinidad (West Indies) where the climate is tropical. The queen lays throughout the year, she may slack down a *little* during the rainy season. A bee-keeper coming from the North would have to learn conditions anew, so as to be successful and vice versa. Bee-keeping in the tropics is simpler and less expensive than in the North.

BEE-KEEPING AND ITS RELATION TO AGRICULTURE.

Having touched on climate, I come to this question. What has bee-keeping to do with Agriculture? This would lead us to study the process of Pollination. Space would not allow me to go into it, as it forms a very intricate and interesting study by itself but we have seen birds, butterflies and other insects flittering from flower to flower. These visitors go about the flowers to get at the *Nectar*. They come in contact with the Pollen and many flowers are thus pollinated. The more pollinated the more fertilised and therefore the larger the crops.

Farmers and fruit growers in the United States of America and Canada have realized the importance of the honey bee and the great part they play in the pollinating of flowers. Bee-men have been offered as much as $5·00 to $6·00 (per colony) just to keep their bees on certain estates during fruit bloom.

The Usine St. Madeleine Company have realized *this* importance and are keeping bees on their coconut estate at Plein Palais.

THE FLORA OF TRINIDAD FROM THE BEE-KEEPERS' POINT OF VIEW.

But we must not go away with the idea that all flowers yield nectar and we can conveniently divide the flowers of Trinidad into four sections.

1st.—Those grown for ornamental purposes as the Rose, Corellila, Dahlia, Holly-hocks, etc., etc.

2nd.—Those from which we get fruits, as oranges, and other citrus fruits, Mangosr Guava, Coconuts.

3rd.—Those used as vegetables, as Corn and the pea family, viz. the pigeon and black-eyed beans.

4th.—The forest trees, as the Hog Plum, Gigge wood, Sage, Mangrove, etc., etc.

Now the first group known as the ornamental group is of very little (importance) value to the bee-keeper, very few producing nectar or pollen.

The 2nd, 3rd and 4th groups are the most important. The quality of the honey would very much depend upon the location. There would be a new era in bee-keeping if there was a large citrus fruit industry in Trinidad.

LOCALITY AND MANAGEMENT.

As locality and management are the two chief factors in bee-keeping I have done some travelling and have studied the situation. We can conveniently divide the island into five sections, the first three according to the three Mountain Ranges, viz:—(1) the Northern, (2) Middle and (3) Southern, (4) The Cocals along the shores where coconuts are grown, where we may also find the Mangrove, (5) Down

South, along Debe and Penal where the Black-eyed bean is largely grown. If the Apiarist would locate under the foot of these hills, he would be able to harvest very large crops (for there is quite a mixture of forage for the bees).

Between these ranges there are acres of Rice and Cane lands in the flats. No forage for bees, therefore the best place to locate large apiaries. If the industry is started in earnest, we have to guard against overcrowding.

THE HIVE AND ITS INMATES.

Now in coming nearer home, let us study the Hive and its Inmates. The natural home of the honey-bee or any other bee would be in some hollow tree; according to Modern Methods, bee-keeping has been made very simple and especially since the Americans have gone into the business so extensively, for to them, very much of the success of our modern bee-keepers are due, and due recognition must be given to this fact. Bees are put up in hives known as their homes, the industry has been made so simple that the handling of a hive may be likened to the leaves of a book. A modern hive is divided into two parts. The lower part known as the Broad Chamber, and the one above as the Super. The frames, ten to each part (standard hives), are imbedded with comb-wax, known as foundation, and are placed in the hive and the bees work on them. Bees draw out their own foundation or wax, but it is far better to give them foundation, and this brings me to what I may term a "trick of the trade." It takes about 12 lb. of honey to make one pound of wax, the bee would have to digest this large amount of honey, and convert it into wax, while if wax was given them, they would store that amount of honey for the Apiarist. Another point which the good bee-keeper guards against is this:—When bees are left to themselves they build a large number of drone cells. Now a hive having a large number of drones would in a short space of time be unprofitable to the bee-keeper. Man has been so ingenious that he prevents this state of affairs to a large extent by giving combs with worker cells, the more workers the more honey stored, therefore the crops are larger.

The inmates of a Modern Standard Hive are:—One Queen, from 50 to 60 thousand workers, and one or two hundred drones.

The queen as the name suggests is the centre of attraction; on her depends the life of the colony and she receives the best attention from the workers; if she is removed, they put up a piteous cry, showing great distress; if she is not promptly returned they would start to rear a new queen.

THE GROWTH OF BEES.

Gentlemen, for you to understand this I must explain how bees grow. We take for granted that the queen is continually laying—may be from 2,000 to 3,000 eggs a day in these hexagonal cells. In about three days the eggs are hatched and then we have a larva, or grub; these are fed by the nurse-bees, (with bee-bread, a mixture of Pollen and honey); after a time they pass on to the pupa stage, and in the case of workers, we have them in 21 days. In case they want to rear a queen these same larvæ are lavishly fed not with bee-bread but with a jelly-looking stuff, known as Royal Jelly. These cells grow much larger like peanuts: they pass through the pupa stage and in about 16 days after the eggs were laid we have a queen. 25 days are necessary for drones. A few days after the birth of a queen she goes on her wedding flight, she is mated with the first drone meeting her on the wing. If the drone is from an inferior stock and a hybrid her progeny would very much be the same.

QUEEN, WORKERS AND DRONES.

Care must be taken that the drones round and about the mating yard and even those in other yards near by should be of a pure stock. The chances of getting pure-bred bees are very poor, for queens have been known to go four and five miles to be mated. She is mated once in her life, the drone dies, she returns to her hive and starts on her life's work—that of laying. She may live 4 or 5 years, but to get the best results. I would advise "requeening" every year. The workers as the name suggests are again subdivided into "Field Workers, Nurse Bees, Sentinels, Attendants, Soldiers, etc. They start from early morning to late in the evening working, bringing in Pollen (which is absolutely necessary in brood rearing) and honey, which they feed on and put up in store or surplus. Its life is very short, one month to $1\frac{1}{2}$ months.

The drone's chief purpose is to husband the queen; he does not gather honey nor has he a sting, he can use up a large amount of honey. So the bee-keeper has to see that he does not rear too many drones.

Now having our bees in good shape we get ready for the crop, which really starts in December and ends in March; very much would depend upon the locality, but the dry months are the honey months for the best honey is then secured. We get a little in between the other months, but of an inferior quality. An average hive would easily yield 8 gallons or 100 lb. for a season, and from 1 to 2 lb. of bees wax. Now for a whole year a hive could easily be made to give bee-products valuing $20·00; the profits are large when well managed.

I have not touched on swarming, because another six pages would be needed, but a paper on bee-keeping would not be complete without it.

The natural way in which they divide themselves and form new colonies is by means of swarms. Nature provides this; otherwise the race would be extinct. The good bee-keeper prevents this as much as possible, except when he wants to increase his colony, but in Modern bee-keeping the bee-keeper can increase his number of colonies by the "Dividing Plan."

BOOKS IN BRIEF.

Introduction to Economics. *By J. R. Turner, Ph.D. Professor of Economics and Dean of Washington Square College, New York University—George Allen and Unwin Ltd., Ruskin House, Museum Street, London, W. C.—Price 15sh. net.*

This is eminently a book introductory to the serious study of Economics. Professor Turner terms it correctly "an outgrowth of class room discussions." He thereby disarms completely, in our opinion, all unnecessary criticism as regards its scope and the method of treatment pursued by him. Professor Turner does not desire his book to take the place of the many existing treatises on Economics: he would be glad if his work leads readers to them. We think his book possesses sufficient merit to achieve this aim. The statement of general principles in it is clear and the avoidance of loose generalities and controversial entanglements is to be highly commended. We would be glad to see the book receive attention in India, where the study of Economics ought to become more popular, if the country is to achieve that progress in the industrial field that is so much desired and desirable. We would add that for the benefit of students Professor Turner has added a set of questions, which are calculated to stimulate independent thought.

Agricultural Insurance.—*By J. S. Chakravarti, M.A., F.R.A.S., etc. Superintendent, Government Press, Bangalore, 4-12-0.*

Many of the chapters which go to make up this work appeared originally in this *Journal* and the attention they received at the time has, we are glad to note, led to their re-publication in the present form. As Mr. Mackenna said at the Bangalore Session of the Indian Science Congress, Mr. Chakravarti's suggestions are not only striking but also original. Mr. Chakravarti has brought to bear on his work much valuable thought and long experience gained in working the Life Insurance system in vogue in this State. We should be glad if his views will lead to some practical action being taken in the matter of agricultural insurance. The suggestions put forward by Mr. Chakravarti are thoroughly practical and deserve to be taken up earnestly by those interested in the well being of the agriculturists of this country.

A Note-Book of Agricultural Facts and Figures—*By R. C. Wood, M.A., Madras Agricultural Department. Third Edition. Superintendent, Government Press, Madras. Price 1 Rupee.*

The popularity this book of facts and figures has attained is evidenced by the fact that this is the third edition issued of it. In a short preface Mr. Wood says that this has been due to the fact that the man in the street takes increased interest in agriculture. This is, we think, true and is well within our own experience. Mr. Wood deserves thanks for the pains he has bestowed on his little but useful book. It teems with valuable information. For the price of one rupee, the most up-to-date scientific information of practical value is available in this book. Mr. Cecil Fisher of the Indian Forest Service has contributed notes on timber trees in the Madras Presidency and these make the book even more encyclopædic for the real agriculturist. We have no doubt that the book will find a larger circulation. A book for Mysore on these lines would be a welcome addition.

Sir J. C. Bose, His Life and Speeches.—*Published by Ganesh & Co., Madras. Price Rs. 2.*

This is a timely publication, in view of Professor Bose's election to the Royal Society. Its interest to us is in the fact that it brings together in brief compass all the more notable utterances of the gifted Indian scientist. The life which precedes them is a short but comprehensive one. The book deserves a wide circulation, and we have no doubt it will have it.

Writing of Mr. Ainscough's paper read before the Royal Society of Arts the *Statist* says:—The opinion which we expressed last week, that the present trade and financial depression in India would right itself very soon, is corroborated in an exhaustive paper read yesterday afternoon before the Royal Society of Arts by Mr. T. M. Ainscough, O. B. E., H. M., Senior Trade Commissioner in India and Ceylon. The reader, who has had an excellent opportunity of studying first-hand the interesting developments which have taken place in British India during and since the War, describes in detail the charges since 1914, dwelling at greater length on the events which have led to the present rather serious position. As is well known, there is something in the nature of a congestion of commodities in Indian as well as in most Eastern markets on account of a diminished buying power on the part of the population, and the credit resources of Eastern banks are, in consequence, severely strained. The situation has been aggravated by the rather disappointing monsoon and the recent slump in the value of the rupee, following the withdrawal of Government support. Despite these factors, Mr. Ainscough is optimistic about the situation, and while strongly, emphasising the need for caution on the part of those engaged in the Indian trade, expresses the opinion that the present abnormal position will be cleared in a few months. His opinion is supported by the recent rally in rupee quotations as well as by the fact that Indian houses have quite recently shown signs of renewing their orders for Manchester cotton goods.

FOUR GREAT BUSINESS BOOKS.

By Herbert N. CASSON.

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